A COURSE OF MEDICAL STUDIES.

A COURSE OF MEDICAL STUDIES:

CONTAINING

A COMPARATIVE VIEW

OF

THE ANATOMICAL STRUCTURE

OF MAN AND OF ANIMALS;

A HISTORY OF DISEASES;

AND

AN ACCOUNT OF THE KNOWLEDGE HITHERTO ACQUIRED WITH REGARD TO THE REGULAR ACTION OF THE DIFFERENT ORGANS.

A WORK CHIEFLY DESIGNED FOR THE USE OF MEDICAL STUDENTS.

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TRANSLATED FROM THE FRENCH.

IN THREE VOLUMES.

VOL. I.

LONDON:

PRINTED FOR CUTHELL AND MARTIN, MIDDLE-ROW, HOLBORN;

BY R. WILKS, CHANCERY-LANE.

1803.

PRELIMINARY DISCOURSE.

In this work I have endeavoured to exhibit a general view of the knowledge acquired in regard to the organization of man.

My principal object in undertaking this labour was to unite different branches of science, designed to illustrate each other, in such a manner as to enable every intelligent person to become acquainted with subjects, which, considering their importance, ought to be more generally cultivated. It is indeed astonishing, at a period when attempts are made to comprehend in public instruction all the useful sciences, that we do not find among them one which gives to man a knowledge of his organic structure; which makes known to him the phænomena exhibited by the regular action of his different parts; and which points out to him the general causes and natural progress of his numerous derangements.

A methodical study of the phænomena of the organization is alone capable of enabling man to avoid what may be hurtful to him, and to acquire those habits which are most conducive to his preservation. For want of this knowledge some abandon themselves with security to irregularities, the dangerous consequences of which they cannot foresee; others, with a view to ameliorate or to preserve their health, subject themselves to an austere regimen; deprive themselves of those varied and agreeable enjoyments which are necessary to com-

plete life; and at length, by miſtaken care, weaken that good conſtitution which they are deſirous to maintain. Thoſe who remain ignorant in regard to the nature of their organization expoſe themſelves alſo, when it experiences any derangements, to the mercy of every thing around them; and it is not uncommon to find perſons of great talents, who in ſuch caſes believe in the greateſt abſurdities, and thus give importance to the moſt dangerous errors.

To this may be added, that the only means of baniſhing quackery, againſt which mankind declaim ſo much, is to propagate the knowledge acquired in regard to the phyſical nature of man. Thoſe, indeed, who have correct ideas of the phænomena of their organization will not readily become dupes to advice dictated by ignorant zeal or by forward ſelfiſhneſs; whereas the rich and the ill-informed are always more expoſed to deception, as the honeſt and enlightened phyſician has too little influence to be able to convince them of their danger, and to protect them againſt the ignorance and effrontery of thoſe who endeavour to miſlead them.

If the ſtudy of the organization, notwithſtanding ſo many motives of intereſt, is not ſo generally cultivated as it ought to be, and if it has not yet been made a part of the uſual courſe of education, this deficiency muſt be aſcribed to the detached manner in which the different branches it embraces have been treated; as they have not yet been united into a proper ſyſtem, worthy of being claſſed among works on the exact ſciences.

But other cauſes alſo have contributed to retard the progreſs of this uſeful ſcience. It may be obſerved, in the firſt place, that a ſtudy which is ſo difficult, and

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which, besides great talents, requires a mind entirely divested of prejudice, could not make a conspicuous figure among the objects of human knowledge, till at a very advanced period of its improvement. It may be remarked, also, that few cultivate this science merely with a view of searching for new discoveries; and this, perhaps, is owing to the disgust which must be overcome before people can acquire sufficient resolution to extend the field of their observation to the sick and the dying. It is well known, also, that young men, who devote themselves to the study of medicine, are in general obliged to apply too soon to practice; which does not allow them sufficient leisure for difficult researches and profound meditations.

In the last place, those who have divided among themselves the different branches which relate to the physical nature of man, do not sufficiently communicate to each other the result of their experience and of their observations.

A physician who begins practice with a certain degree of knowledge, is always struck with the confusion exhibited to him by the science of medicine. At first, he ascribes it to the difficulty of the study; but if he continues to be a calm observer, and to believe nothing implicitly, he soon perceives that those who cultivate the different branches of which it is composed have so little intercourse, that, though very extensive knowledge has been obtained, the result of their individual labours is, for the most part, lost to the science in general; and that a great number even, without knowing it, are divided in their opinions in regard to the principal points on which it is founded. Hence it happens, that the distinct study of the different parts of the history of the

organization, inſtead of promoting, ſerves rather to retard its progreſs; becauſe thoſe by whom it is cultivated do not ſet out from common and fundamental principles, to which all their particular obſervations might be referred.

When a phyſician, therefore, begins to practiſe, he is neceſſarily ſtruck with the number of popular errors which he every where finds among perſons who are always deſirous to explain, in their own manner, the different phænomena of health and diſeaſe; which indicates, at leaſt, how anxious they are to obtain information reſpecting every thing that relates to the organization. Unfortunately, moſt phyſicians ſeem, at firſt, to participate in theſe falſe notions, that they may not too openly attack received opinions: by theſe means they gradually become familiarized with them; and at length adopt them entirely as inconteſtable truths. Thus, men who in conſequence of their ſituation ought to contribute moſt towards the diffuſion of uſeful knowledge, only give importance to fatal errors, which being eſtabliſhed by time and the force of habit, muſt be difficult to be eradicated, and can be deſtroyed only by their united efforts.

Before I enter into any detail in regard to the plan of the work, the motives of which I have here explained, it will be proper to make a few general obſervations on organized bodies.

Organized bodies have been divided into vegetables and animals; but they are far from being all naturally ſuſceptible of arrangement under theſe two diviſions. There is a very numerous ſeries of beings evidently organized, with the intimate ſtructure of which we are abſolutely unacquainted, either on account of their extreme

treme minutenefs, or becaufe their tranfparency deprives us of the means of obferving their organs, by making them appear to us under the form of a homogeneous vifcofity.

When thefe beings develop themfelves without changing their place, or by exhibiting a fort of ramification, they are claffed among vegetables: of this kind are the byffi, lichens, fuci, ulvæ, confervæ, and tremellæ. On the other hand, when they move, or feem to have a diftinct alimentary canal, like the volvox, monades, fponges, lithophites, alcyons, &c., they form a part of the clafs of animals. There are alfo feveral fpecies which are placed alternately in thefe two claffes, according to the different obfervations which have been made.

It appears, that it is among thefe beings, fo little known, that the divifion between animals and vegetables takes its origin, or where the two claffes are confounded.

The numerous clafs of animals exhibit a natural divifion by the exiftence or non-exiftence of the vertebral column. The difference between vertebral and in-vertebral animals is fo great, that Daubenton was of opinion that the former ought not to retain the name of animals, if it be given to the latter.

Vertebral animals comprehend fifhes, reptiles, birds, and the order of the mammalia, at the head of which man is placed.

The knowledge acquired in regard to the organization of man, which I have endeavoured to unite in this work, comprehends:—1ft. Anatomical refearches; 2d. A hiftory of difeafes; 3d. An examination of the vital

 functions.

functions. These three branches of knowledge, which compose the philosophy of man, naturally divide the work into three parts.

First Part. The anatomical description of man, as well as that of a great number of animals, which forms the subject of the first part, has been given with great minuteness, and scrupulous exactness, by celebrated anatomists: but as a complete and connected view of the different systems of organs in man, compared with the same systems of organs in other animals, is not to be found in any work, the result was, that only one part of the picture was exhibited; and therefore it was impossible to form a proper idea of the whole. The lectures of Cuvier, from which I have endeavoured to derive as much advantage as possible, and which were collected and in part published by Dumeril, will form in this new line a complete work, the conclusion of which is looked for with impatience.

The first difficulty which occurs, in describing the systems of organs, arises from the choice of the order proper to be adopted. As all the systems of organs discharge their functions almost simultaneously, a successive description of them is always attended with this disadvantage, that it separates objects which ought to remain united. It was therefore necessary that the order adopted should, as far as possible, remedy this inconvenience.

The whole of the parts of the body is composed of six principal systems:

1st. The system of the bones and muscles.

2d. The cerebral and nervous system.

3d. The system of the senses.

4th.

4th. The ſyſtem of digeſtion.

5th. The ſyſtem of circulation and reſpiration.

6th. The ſyſtem of generation.

The deſcription of each of theſe ſyſtems, in man, is preceded by a curſory view of the correſponding organs in the different claſſes of animals.

In the ſyſtem of the bones will be ſeen the variety of forms exhibited by the ſkeleton, from that conſiſting of one ſeries of ſimilar vertebræ, of which the head ſeems to be only one more complex, to that which is compoſed of a vertebral column, a head, a thorax, and limbs.

The diſpoſition of the muſcles varies according to the parts to which they are attached.

The deſcription of the bones, and of the muſcles, is followed by tables, the arrangement of which is ſuch, that, while they preſent a nomenclature of the different parts, they exhibit their poſition and their uſe.

The ſyſtem of the bones, and that of the muſcles, conſtitute the foundation of the human body. They comprehend the greater part of its material ſubſtance; and the other organs exhibit a diſpoſition which is neceſſarily ſubordinate to them.

The cerebral ſyſtem is compoſed; 1ſt. Of the encephalic organ, united to its rachidian prolongation. 2d. Of the ganglions of the triſplanchnic. Theſe two principal organs, analogous ones to which are found in all vertebral animals, give riſe to the nerves that diſtribute the principle of motion and ſenſation to the different parts. It is obſerved, that the nerves proceeding from the triſplanchnic are diſtributed, in particular, to the veſſels which form the different tiſſues, and to the organs not ſubject to the empire of the will; and that

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they thus maintain that animal life only which each point of the organization enjoys; while thofe which proceed from the encephalon and its prolongation furnifh to the principal fyftems of organs fecondary nerves, which communicate to them relative life, by caufing them to perform the function for which they are proper. It is to be remarked, that in all animals the organs diftributed to the organs of the fenfes, and to fome other determinate parts, are always furnifhed by analogous pairs.

The defcription of the cerebral and nervous fyftems in man is followed by a fynoptic table of the nerves, and an analytical view of the cerebral organ, with a recapitulation of the various parts which compofe it, and of which the ufe is unknown.

The organs of the fenfes are merely particular terminations of fome nerves, difpofed in fuch a manner as to perceive the flighteft impreffions, and to vary the forms of touching. An examination of thefe organs in the different claffes of animals, beginning at the fimpleft, and proceeding to the moft complex, affords the only mean of difcovering the ufe of the different parts which enter into their compofition. Thus, it is feen that among the numerous pieces of which the ear is formed, the one moft important and indifpenfably neceffary for that organ is the membranous capfule, containing a vifcous fluid, amidft which the auditory nerve expands; becaufe this capfule is found in all animals, and in fome it exifts alone.

In the defcription of the digeftive fyftem, either in animals in general, or in man in particular, the progrefs of the aliments has been followed. It is curious to examine the gaftric fyftem in different animals, from thofe

those in which it consists of a single bag with one aperture, to those in which it is composed of a mouth armed with teeth, with a tongue, with salivary glands, &c.; of an œsophagus, which leads to one, two, three, and even four stomachs; of intestines of different lengths and sizes, provided with cœcal appendices, more or less numerous, and receiving fluids from a liver and a pancreas.

The result of digestion is the chyle: this fluid, absorbed by particular vessels, proceeds into the veins; which affords a natural transition from digestion to circulation.

In the system of circulation, the course of the blood has been followed, by giving a successive description of the organs which it traverses. This system, in animals, exhibits a still more astonishing variety of forms than the digestive system. How many particular arrangements are observed between the mammalia, whose blood is warm and red, and the worm, which seems to have only one dorsal vessel, with branches ramified to every part of the organization, and a few external apertures which afford an entrance to the atmospheric air!

In man, the arterial blood, which is of a bright red colour, and which has the temperature of 40 degrees of the centigrade thermometer (104° Fahr.), when it proceeds from the aorta is distributed by an order of vessels (the arteries) to every part of the organization. During its progress, it is continually freeing itself from the excess of its heat by the excretion of the cutaneous organ; and from its excess of aqueous, saline, &c. parts, by urinary secretion. The blood, after supplying every part with the materials of nutrition, returns by two orders

orders of veſſels (the veins and the lymphatics), and traverſes organs which tend to make it reſume the qualities of arterial blood. For the lymph, theſe organs are: the numerous lymphatic glands; and for a part of the venous blood, the hepatic ſyſtem.

The lymph mixes with the venous blood, and the veins unite into two large trunks, which pour the blood into the right ſide of the heart; whence the whole of it paſſes into the pulmonary organ: it is diſtributed to every part of that organ, and during the act of reſpiration reſumes its former qualities of arterial blood: it then proceeds to the left ſide of the heart, whence it paſſes into the aorta, to ſerve for a new circulation.

In the deſcription of the different parts of the ſyſtem of circulation, by thus following the progreſs of the fluids, the reader is better enabled to comprehend the organic phænomena, and in ſome meaſure to divine the laws by which life is maintained.

Having deſcribed the organs which the blood traverſes, and ſhown the reſults of the chemical analyſis of that fluid, an accurate deſcription is given of the diſtribution of the arteries, followed by a ſynoptical table of theſe veſſels. This article is terminated by the veins and lymphatics; and in explaining them the progreſs of the fluids is ſtill followed, as far as poſſible, by taking the veſſels at their capillary origin, and tracing out their union into ramuſculi, rami, branches, and trunks.

In explaining the lymphatics, the glands are deſcribed in the order in which theſe veſſels proceed thither. This method ſeems to be the moſt convenient.

In the laſt place, this firſt part is terminated by a deſcription of the ſyſtem of generation, with a curious detail of the parts of which it is compoſed in different animals.

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It is there ſeen that if all organized beings are connected by ſome relations, it is in particular by the organs of generation; for an analogous ſtructure of parts is found in all thoſe the generating organs of which are known.

This firſt diviſion concludes with a curſory examination of the general ſtructure of the tiſſues, of which the different ſyſtems of organs are compoſed. It is obſerved that all theſe ſyſtems (anatomical ſyſtems of organs) conſiſt of a certain number of ſimilar parts. It is of very great importance to examine carefully their general diſpoſition, as theſe parts perform analogous functions, and as they experience derangements of the ſame nature. This laſt circumſtance tends to throw great light on the hiſtory of diſeaſes, which is treated of in the ſecond part.

In deſcribing the different derangements to which the higher orders of ſociety are at preſent ſubject, it appears on the firſt view impoſſible to claſs, in a proper manner, all theſe diſorders ſo exceedingly various: however, by the help of a few general conſiderations, reſpecting the whole of their moſt important phænomena, it will ſoon be found that they may all be arranged under a few principal heads, from which the particular caſes may be naturally deduced.

Diſeaſes conſiſt in an alteration of the parts, or in a derangement of their regular action. Thoſe which exhibit a manifeſt alteration in the intimate ſtructure of the organs compoſe the *phlegmaſiæ:* thoſe which conſiſt in a *general* or *particular* derangement in the exerciſe of the functions, without any eſſential alteration of the parts, eſtabliſh the ſeries of *fevers*, or the different orders of *affections*, which in ſome meaſure are merely *nervous*.

Any irritation whatever, excited in a part, produces a new

a new mode of action, the refult of which is a feries of phænomena that may vary, according to the ftructure and ufes of the affected part. Thus, phlegmafiæ exhibit peculiar characters, according to the parts where they are developed. All thefe difeafes of the fame order, when confidered in fucceffion in the different anatomical fyftems of organs, furnifh very natural marks of feparation. This diftinction, for which we are indebted to the moderns, but which has not yet received all the extent of which it is fufceptible, has thrown great light on the phænomena of thefe affections. Thus, in the hiftory of phlegmafiæ, thefe affections are diftinguifhed into the following claffes: 1ft, Thofe of the cellular and parenchymatous tiffue; 2d, Thofe of the ferous membranes; 3d, Thofe of the mucous membranes; 4th, Thofe of the white fibrous parts; 5th, Thofe of the bones; 6th, Some fpecial organic affections; 7th, Phlegmafiæ of the fkin.

The phlegmafiæ comprehended in each of thefe fections exhibit very important differences, according as their progrefs is rapid or flow (acute or chronic phlegmafiæ), and under various other points of view.

It is to be obferved that in thefe orders of phlegmafiæ almoft all the difeafes called *chirurgical* or *external* are united and confounded, with a great part of thofe called *internal*. A comparifon of thefe derangements, of the fame nature, which reciprocally illuftrate each other, is fufficient to fhow how abfurd it was to keep them always feparate.

In the hiftory of phlegmafiæ it is feen that thofe of the cellular tiffue and mucous membranes have given rife to the popular errors in regard to *humours*. In thefe difeafes, the regular action of the cellular tiffue, or of the mucous

mucous membranes, is deranged; and these parts, instead of furnishing the liquid by which they are habitually lubricated, secrete a more abundant humour often highly irritating, which has been considered as the cause of the disease, while it is merely the effect. It was therefore imagined that this humoral cause might exist in all other cases of disease, though not apparent. This unfounded supposition produced, in the course of time, a very seducing theory, which by the concurrence of a thousand particular circumstances was afterwards adopted.

When phlegmasiæ have a rapid progress, the local alteration is sometimes so great as to produce in the whole of the different functions that general derangement which constitutes *fever*.

Phlegmasiæ then naturally lead to the history of *fevers*, by an account of those called *eruptive*. In these fevers, the febrile derangement, instead of being produced by a local affection, as in phlegmasiæ, gives rise to an eruption of the skin, which appears about the third or fourth day of the disease. In describing the eruptive fevers, I have dwelt more particularly on the natural or inoculated small-pox, and on the vaccine: this article will enable the reader to appreciate easily what has been said for or against this discovery.

The chapter of fevers has always been one of the most obscure in all works on nosology, because the nature of the derangement which constitutes this order of diseases has never been considered under its real point of view. There is only one sort of derangement, characterized by a general perturbation of the functions, which constitutes FEVER; but this disease afterwards assumes a thousand particular forms, according to the causes which produce

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it, and the difpofition of the individuals: it conducts back to health or terminates in death, by a feries of phænomena which fucceed each other with a fort of regularity.

Of fevers fome have a *continued* progrefs, with ftriking exacerbations; others come on regularly by paroxyfms, which leave between them a *remiffion*, more or lefs complete, and which in this manner feem to be fo many diftinct difeafes. This circumftance, of fo much importance in the progrefs of the difeafe, and which renders fo great a difference neceffary in the treatment, furnifhes the firft divifion of *fevers* into *intermittent* and *remittent*. There are no fufficient reafons for uniting affections which exhibit characters fo effential and fo diftinct.

Continued fever exhibits forms highly varied, from the flight paroxyfm, which terminates fpontaneoufly at the end of twenty-four hours, to the form which continues for a longer or fhorter time, with a fucceffion of phænomena more or lefs violent, and which, for the moft part, proves fatal.

In this long feries of affections it is obferved that fome of them have a regular progrefs, which brings back health at the end of a limited period (*fimple fever*); and that others, exceedingly fevere and frequently fatal, are fufceptible of becoming epidemic, and even contagious. (*Pernicious fever*.)

Pernicious fever is characterized by a ftate of extreme proftration (*adynamic or putrid fever*); fometimes it exhibits in its fymptoms abrupt changes and different anomalies (*malignant or ataxic fever*): in a word, this pernicious form prefents very remarkable varieties in the hofpital or jail fever, the yellow fever and the plague, which

which are only the fame difeafe with comparative degrees of intenfity.

Intermittent like *continued* fever exhibits a *fimple* and a *pernicious* form. The fimple form varies according to the time which elapfes between two acceffions, and furnifhes the *tertian*, *quartan*, *quotidian*, &c. types.

The pernicious form may take place under the different types above mentioned: it is characterized by the exacerbation of any fymptom, which frequently brings on death at the end of the third or fourth acceffion. It often exhibits the epidemic character.

This fimple and natural arrangement of febrile difeafes, while it renders the ftudy of them eafier, tends to throw fome light on the nature of the phænomena which conftitute them, and to furnifh hints for the mode of treatment which ought to be employed.

The difeafes not claffed among the phlegmafiæ and fevers are all thofe which arife from particular derangements in the *exercife* of fome of the organs, whether the nervous action of their parts be diminifhed, increafed, or deranged. Thefe numerous affections may be naturally claffed under the four following heads: *comatofe*, *afthenic*, *fpafmodic*, and *vefanic* affections.

Comatofe affections, characterized by a fufpenfion of the principal external figns of life, comprehend: *apoplexy*, the various kinds of *afphyxia*, *catalepfy*, and *fyncope*.

Afthenic and fpafmodic affections are taken into confideration fucceffively, according as they are obferved in the different fyftems of organs.

The vefanic affections, which exhibit a derangement more or lefs ftriking of the intellectual functions, are: *hyfterics*, *nymphomania*, *fatyriafis*, *hypochondriafis*, *melancholy*, and *mania*.

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In the long recapitulation by which the hiftory of difeafes is terminated, an attempt is made to prove that man is not fubject to more difeafes than animals; and to fhow in what manner the different affections to which he is expofed may have been developed at different periods of civilization, and under different circumftances of climate, food, habits, &c. It is there feen that animals, collected into herds and flocks, are fubject, under analogous circumftances, to affections of the like kind.

The treatment moft proper for the different difeafes is deduced from general confiderations on the nature of their development, on the general progrefs of their fymptoms, and the regular action of the vital phænomena. The effects daily produced by a blind adherence to the common medical routine furnifh alfo a feries of proofs, which has not been neglected.

When medicine was a fcience merely hypothetical, it proved of great utility in the hands of the phyfician who formed the beft conjectures; but at prefent, when anatomical knowledge has been carried to the higheft degree of perfection, when the hiftory of difeafes is complete, and phyfiological refearches begin to be very extenfive, it can no longer be faid that the medical art is deftitute of a proper foundation.

When anatomy was little cultivated, in confequence of the ftudy of it being fettered by religious prejudices, furgery alfo was often an art merely conjectural, the precepts of which were mixed with the groffeft errors: but for half a century paft, during which anatomy was more generally cultivated, furgery in France made a rapid progrefs, and has now attained to a degree of fuperiority which makes it to be held in high eftimation. Men, indeed, who have a thorough knowledge of the ar-

rangement of the parts, and of the diforders which alterations in them produce, ought to be the moft proper for applying the neceffary remedies. For the fame reafon, thofe who with a correct knowledge of anatomy have carefully obferved the regular action of the different organs, and the natural progrefs of the derangements to which this action is liable, muft alone be capable of giving falutary advice in regard to thofe difeafes which effentially belong to the province of medicine.

The knowledge acquired in regard to the comparative ftructure of man, which forms the fubject of the *firft part*, and the numerous difeafes, the hiftory of which is given in the *fecond*, furnifh a fund of information, by the help of which the regular action of the different vital functions is examined in the *third*.

In examining the *functions* of the different fyftems of organs, the order adopted in the *defcription* of thefe fyftems has been followed; beginning, however, with the action of the nervous and cerebral fyftem, without which there can be no life.

The cerebral fyftem is firft confidered as an organ of fecretion. The large quantity of blood which the heart fends to the brain by a very fhort paffage; the peculiar difpofition of the arteries, which diftribute it to the furface of that organ; the ftate of extreme divifibility which it foon affumes by penetrating into its interior parts; the flow and tortuous progrefs which it affects in its return, all announce that this common principle of nutrition ferves for a very important fecretion, and the cerebral organ feems to affimilate a fluid of great tenuity, which is diftributed by means of the nerves to all the parts of the body, where it maintains, by its prefence, the action peculiar to them.

It is obſerved, indeed, that the different organs perform their functions only by the regular and continued action of the nerves which they receive; and that this action of the nerves depends on that of the cerebral organ, from which they proceed. Hence a change produced in the regular action of the cerebral ſyſtem is manifeſted by a derangement in the function of the parts to which it furniſhes nerves.

In examining the arrangement of the nerves, it is obſerved that thoſe which proceed from the ganglions of the triſplanchnic are diſtributed, in particular, on the trunks of the large veſſels, and ſeem to accompany them in all their diviſions.

The veſſels by their interſection form different tiſſues, and the particular diſpoſition of theſe tiſſues produces the different ſyſtems of organs. Theſe ſyſtems, independently of that life, in ſome meaſure merely animal, poſſeſſed by the vaſcular tiſſue of which they are compoſed, and which is maintained by the influence of the triſplanchnic, have need of receiving other nerves to enable them to execute the functions peculiar to them. Theſe nerves proceed from the brain and from its vertebral prolongation; and give to theſe organs a new action, more energetic and more extenſive, which conſtitutes relative life.

Having conſidered the cerebral ſyſtem, in regard to the vital action which, by means of the nerves, it continually maintains in every part of the organization, it is examined with reſpect to the impreſſions tranſmitted to it by the ſame nerves. The cerebral organ, at the ſame time that it diſtributes to every part of the body, by the expanſion of its nerves, that principle of action which is neceſſary for maintaining life, receives in all theſe parts impreſſions

impreſſions tranſmitted to it by the ſame nerves, and which continually tend to maintain or to modify its action. The preſence of a fluid highly elaſtic, analogous to the electric fluid, ſecreted by the cerebral organ, and to which the nerves ſerve as conductors, furniſhes an hypotheſis exceedingly proper to account for the reciprocal and inſtantaneous action of the cerebral ſyſtem and of other organs.

All objects which come into contact with the nerves, at their ultimate expanſion over the different parts, may produce impreſſions ſuſceptible of being tranſmitted to the cerebral ſyſtem, and of modifying its action.

In explaining the numerous phænomena which reſult from the exerciſe of the different functions, thoſe exhibited by the organs of the ſenſes are the moſt curious. The ſtudy of theſe phænomena is particularly intereſting in the ſyſtems of viſion and of hearing; as the obſerver will find, and may follow in them, a ſeries of facts, which are agreeable to particular laws in natural philoſophy.

The parts moſt proper for perceiving lively impreſſions, are evidently the ſyſtems of the ſenſes. Theſe ſyſtems may be conſidered as organs of touching, more or leſs delicate. It is indeed obſerved, that by means of a particular diſpoſition of the nervous ſyſtem theſe organs perceive the impreſſion made on them by the contact of reflected light, of air in a ſtate of vibration, of certain moleculæ of matter diſſeminated throughout the inſpired air, of ſome ſoluble ſubſtances, and of all bodies capable of acting with a certain intenſity on any one of our parts.

In this article care has been taken to trace out, as far poſſible, the development of the different ſenſations. It

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is, in the firſt place, obſerved that ſtrong and unuſual impreſſions, capable of diſturbing the regular action of the organs, produce a change of ſtate, which conſtitutes the *ſenſation of uneaſineſs*; and, on the other hand, that thoſe which contribute to complete life by maintaining the natural motion of the functions, produce another change of ſtate, which is the *ſenſation of eaſe*. In the laſt place, it is to be obſerved that every living being is irreſiſtibly excited to *act*, in order to withdraw itſelf from the cauſes of deſtruction, and to place itſelf under circumſtances favourable to its preſervation.

The habit of thus receiving alternately painful and agreeable ſenſations, ſoon renders living beings capable of appreciating very ſlight changes of ſtate, in ſome meaſure indifferent to the organic order, and which conſtitute ſimple *ſenſations*.

The faculty of perceiving ſimple ſenſations becomes an organic function, which, like all the reſt, is improved by proper exerciſe, and by the force of habit. It reſults from this diſpoſition, that the ſimple ſenſations already experienced may be completely renewed without the preſence of the objects by which they were firſt communicated; but merely by circumſtances which have a greater or leſs relation with them.

The faculty which man has of experiencing *recalled ſenſations*, in conſequence of new *direct ſenſations*, and the neceſſity of *acting* to avoid pain, to ſatisfy his wants, and to obtain eaſe, makes it neceſſary for him to *combine* theſe different ſenſations, and to act agreeably to the reſult of that combination.

The faculty of combining ſenſations gradually increaſes with the ſlow progreſs of civilization; and this function, which at firſt ſeemed to be a blind kind of inſtinct,

ſtinct, gives riſe to the nobleſt operations of the human mind.

Theſe ideas on the development of ſenſations, and the origin of the intellectual faculties, which are deduced from the knowledge acquired in regard to the ſtructure of the organs and the phænomena they produce in the different circumſtances of health and diſeaſe, may give to metaphyſics that ſolid baſe which has hitherto been wanting.

An examination of the vital action in the bones gives riſe to ſome important conſiderations.

The function of the gaſtric ſyſtem exhibits a ſeries of very remarkable phænomena. It is obſerved, that the digeſtive power does not belong excluſively to the gaſtric apparatus, but that it is peculiar to all the organs. Hence foreign ſubſtances, brought into contact with parts of the body, either in the aërian paſſages, in the interior or at the ſurface of all the tiſſues, and even of the ſkin, may be digeſted. The nutritive parts ſuſceptible of entering into the compoſition of the animal fluids are taken up by the abſorbing veſſels, and the reſiduum is thrown out.

Digeſtion, properly ſo called, that which is effected in the ſtomach and inteſtines, is the reſult of the whole influence of the vital power. The aliments of whatever kind are transformed into a chymous pulp, which always contains chyle of the ſame nature; this aſſimilation is produced by the action of the digeſtive juices, favoured by the preſſure of the ſides of the inteſtines on the alimentary ſubſtances, but in particular by their long ſtay in a living organ, where that aſſimilating power, which is obſerved only within the ſphere of the activity of organized bodies, is exercifed in its full extent.

In the function of the gaſtric ſyſtem are diſtinguiſhed:

the digeſtive action of the organs on the alimentary ſubſtances; the ſtimulating action of the aliments on theſe organs, and the reſults of this reciprocal influence.

This article is terminated by pretty extenſive conſiderations on the general mode of action of medicines.

In the ſyſtem of circulation, after conſidering the force by which the blood is propelled from the heart, and that which continues to make it circulate in the veſſels, the changes which this fluid undergoes in traverſing different organs is examined.

The continual loſs which the blood experiences, in conſequence of the different excretions, is repaired by the products of digeſtion and of reſpiration. In this uninterrupted aſſimilation, it is of great importance to obſerve, that the ſubſtances which iſſue from the body exhibit altogether more denſity than thoſe which enter it, the reſult of which muſt neceſſarily be an habitual elevation of temperature.

The exceſs of the heat of the blood is carried off by the evaporation of the ſweat, which even produces that exceſs of heat; and the habitual temperature remains nearly at 40 degrees of the centigrade thermometer, (104° of Fahren.)

In arterial circulation, the blood, by means of the kidneys, is ſtill freed from its exceſs of aqueous parts, and from different ſaline ſubſtances.

The arteries, in diſtributing themſelves to all parts, are ſubdivided indefinitely, and reduce the arterial blood to a ſtate of rarefaction proper for effecting the different changes which take place in every part of the organization. This repairing fluid afterwards returns by the veins and the lymphatics, the degree of the capillary minuteneſs of which is equal to that of the arteries.

ries. During its return, the venous blood undergoes different aſſimilations, which tend to make it reſume its qualities of arterial blood. The lymph and the chyle acquire new characters of animalization, in paſſing through the numerous lymphatic glands. The venous blood, in its partial paſſage through the liver, frees itſelf from oily and albuminous ſubſtances; but it is in the pulmonary organ, in particular, that this fluid experiences the moſt important changes, and completely reſumes the qualities of arterial blood: it there frees itſelf from the materials of carbonic acid gas, as it abandoned in the liver the conſtituent principles of the bile. Neither carbonic acid gas, however, nor bile are found ready formed in the blood; they are the reſult of a ſpecial ſecretion; and ſome have been inclined to believe that in the act of reſpiration the carbonic acid does not ariſe from a particular combination of the oxygen of the air with the carbon of the blood, ſince animals expoſed in azotic and hydrogen gas throw out carbonic acid gas, as they do in atmoſpheric air.

The air in iſſuing from the lungs, with more or leſs force, can diſcharge another important function: the moveable cartilage which covers the aperture of the glottis, like the mouth of a wind inſtrument, cauſes the air to vibrate in its paſſage, and gives riſe to the production of ſound. Thus, every thing in the organization is fitted for being uſeful; the expired air ſerves for the production of melody and of ſpeech, as the excretion of the bile becomes one of the powerful inſtruments of digeſtion.

Generation, conſidered in regard to the general reproduction of organized beings, exhibits a remarkable uniformity. All living beings produce, in ſome of their

parts, ſmall bodies; which, by their further increaſe, form beings ſimilar to thoſe from which they ariſe. In ſome claſſes theſe beings in miniature (*buds*, *gems*, &c.) require only, for their expanſion, to be ſeparated from their mother, and to be placed under certain favourable circumſtances (*ſlips*). In others, theſe ſmall bodies (*ſeeds*, *ova*, *germs*) are not completely developed until ſome ſpecific irritant has impreſſed on them, by its contact, the firſt movement of individual life. Reproduction, conſidered in this general manner, becomes a phænomenon which can be reconciled much better with the principles of philoſophy, than that of the transformation of the aliments into a chymous pulp.

The laſt part concludes with a view of the knowledge acquired in regard to the vital functions. In this part, particular attention is paid to the development of the intellectual faculties. By obſerving the ſlow progreſs of this faculty, during the firſt years of life, and at the different periods of civilization, the ſucceſſive connection of theſe different phænomena can be followed. But if we neglect to examine the earlieſt exertions of this function; if we attempt to account for the phænomena exhibited by the human mind when it has attained to the higheſt degree of intellectual vigour, without having previouſly obſerved, with care and attention, the development of the different ſenſations, and the origin of the rational faculties, we ſhall find nothing but an immenſe abyſs, into which it will appear impoſſible to penetrate, and man will ſeem condemned to remain a ſtranger to the nature of that faculty which he daily employs for making new diſcoveries.

When it is conſidered that men who had no knowledge of the organic ſtructure were the firſt who attempted

to

to explain the phænomena of the moſt aſtoniſhing function of the organization, the capital errors which occur in their works will not excite ſo much ſurpriſe as the great diſcoveries which they made.

It may readily be conceived that the only proper method to be purſued in order to explain, in a ſatisfactory manner, the function which gives riſe to the intellectual faculties, is to acquire a thorough knowledge of the organic ſtructure, and of the natural progreſs of the functions under the different circumſtances of health and of diſeaſe.

If in the ſearch after truth we ought to proceed from things known to thoſe which are unknown, it will be neceſſary to ſtudy the *phyſical* nature of man before we attempt to make reſearches in regard to *what is beyond* the province of natural philoſophy, and which forms the object of *metaphyſics*.

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1. The organs of ſmall animals are not ſupported by oſſeous parts; bones in general are found only in the large animals; and the ſkeleton which they afford ſeems always to have been formed according to an uniform plan.

The ſkeleton determines the general form of the animal; it contains ſome organs, and ſupports others; it affords points to which a great many are attached, and ſerves for various kinds of motion.

Animals which have a ſkeleton are called *vertebral animals*; becauſe in the ſkeleton the vertebral column is a conſtant and central part, little ſubject to variation.

The ſkeleton of ſome animals conſiſts only of the vertebral column and the head; but in the greater number there are alſo limbs.

2. Vertebral column in animals. The vertebral column, *rachis*, or ſpine, is conſtituted of a ſeries of longer or ſhorter bones, variable in extent, called *vertebræ*.

The number of the vertebræ varies between 16 or 20 to more than 200 in fiſhes, and in ſome ſerpents it exceeds 300.

The vertebræ are each compoſed of one eſſential part, which is *the body* of the bone; the vertebræ are placed one above the other, and in this manner form a column, which ſerves to ſupport the trunk, and as a ſtay to the head.

Vertebræ, of the ſimpleſt kind, conſiſt ſometimes merely of the body. The more complex have alſo a groove or an arch, and protuberances on four faces. Each vertebra therefore has two faces for joining to the two contiguous vertebræ; the reſt of its ſurface, whatever be its form, always preſents four faces: a ſpinal face, *ſpina dorſi*; a præſpinal or antiſpinal; and two lateral ones.

The ſpinal face has ſometimes a notch like that in the ſpine of oſſeous fiſhes; but for the moſt part it is furniſhed with a cavity which forms a hole.

The

The junction of the notches produces a groove, that of the cavities a *canal*.

The ſpinal face exhibits alſo, in general, a protuberance called the *ſpinal apophyſis*: it is placed above the cavity; and when there is a groove the latter is cut out on the apophyſis.

The ſpinal apophyſis of the vertebræ varies both in its form and its direction; it is more or leſs elongated, round or flattened; terminates in a point or edge, and ſtands at right angles, or proceeds in an oblique direction.

The præſpinal face is ſeldom furniſhed with apophyſes; they are obſerved however in the vertebræ of the rattle-ſnake, and in the tails of fiſhes.

The lateral faces ſometimes have only apophyſes, called tranſverſe, which ſupport the ribs, as is the caſe in fiſhes; but other animals have two other articular or *lateral apophyſes*, one above, the other below the tranſverſe apophyſis, and articulated with the adjacent vertebræ correſponding to them.

On the ſides of the vertebral canal there are holes or *foramina*, which penetrate to its cavity.

Striking differences are obſerved in the vertebræ in regard to their connection. In fiſhes they join only by their ſubſtance; in other animals they are articulated not only by their ſubſtance, but by their articular apophyſes.

 The

The articular faces of the bodies of the vertebræ have fometimes conical cavities, as in fifhes: the junction then takes place by the edges of thefe cones; and the *rachis* or fpine forms a feries of elliptical cavities, filled with a white firm and elaftic or *cartilaginous* fubftance; but for the moft part the vertebræ are articulated by their plain furfaces. The furfaces of the articular apophyfes exhibit the fame difpofition.

The difpofition of the articular faces of the vertebræ, and that of their apophyfes, always determine the quantity of motion they can perform by the means of mufcles; this motion may be exceedingly free when the vertebræ are articulated only by their bodies, and when their apophyfes do not mutually confine each other, as is the cafe in fifhes: by a contrary difpofition they may be reduced to perfect immobility.

The rachis or fpine of fome fifhes confifts of a long feries of vertebræ, which exhibit no difference; in ferpents, a great part of the vertebræ are joined to ribs, but thofe towards the tail are not: the former are called *dorfal*, the latter *caudal vertebræ*.

The greater part of fifhes have alfo vertebræ united to ribs, and which are called dorfal; but the caudal vertebræ, towards the belly, are all furnifhed with apophyfes: fifhes have fome likewife without ribs, and which exhibit no ventral apophyfes:

apophyſes: theſe vertebræ, when they are above thoſe of the tail, are called *lumbar*, and when immediately below the head, *cervical*.

In animals provided with limbs a part of the vertebræ receive the ribs; another part are ſuſtained by the *pelvis*, and the reſt remain free above and below the *thorax* and the *pelvis*: this diſpoſition allows us to diſtinguiſh the vertebræ into *cervical*, *dorſal*, *lumbar*, *pelvian*, and *caudal*.

The *cervical* vertebræ are between the head and the thorax; the *dorſal* ſuſtain the ribs; the *lumbar* lie between the thorax and the *pelvis*; the *pelvian* are affixed to the pelvis, and the *caudal* come after the pelvis.

The cervical vertebræ, in the *mammalia* *, are in number always ſeven: in the other claſſes they vary.

3. Vertebral column in man. Man has ſeven cervical vertebræ, twelve dorſal, five lumbar, five pelvian united and forming a bone called the *os ſacrum*, and three or four caudal alſo united, and forming a ſmall bone called the *coccyx*.

4. *Vertebræ.* In general, each vertebra preſents a body, on the ſpinal face of which is a ring;

* Except the three-toed ſloth, which has nine.

the whole of theſe rings forms the *vertebral canal.* Before the ſpinal arch of each ring is a *ſpinal apophyſis*; on each ſide of the body or ring of the vertebræ is a *tranſverſe apophyſis*, and above and below this apophyſis there is another *articular* one.

The articular apophyſes unite with the correſponding ones of the neighbouring vertebræ. In the cervical and dorſal vertebræ the facets of the ſuperior articular apophyſes are turned backwards; thoſe of the inferior forwards; while in the lumbar vertebræ the ſuperior facets are turned inwards, and the inferior ones outwards.

Between the articular apophyſes of one vertebra and that adjoining to it is a hole which communicates with the vertebral canal (24 *vertebral foramina).*

In the cervical region the upper part of the bodies of the vertebræ is indented and inclined forwards: in the reſt this part is plane and horizontal.

The firſt cervical vertebra, called the *atlas,* is a ſimple ring, which on its upper part and both ſides preſents two facets for its articulation with the head, and two others below unite it with the ſecond. The internal part of the arch of this firſt vertebra exhibits alſo an articular facet, which ſupports a round and elongated tubercle *(proceſſus odontoides)* which riſes above the body of the ſe-

cond

cond vertebra. The latter is diſtinguiſhed by the name of *axoides*.

The free motion of the head on the neck ariſes from the peculiar diſpoſition of theſe firſt two vertebræ.

The cervical vertebræ are the ſmalleſt: their bifid or forked ſpinal apophyſes are turned a little downwards, and their tranſverſe apophyſes are perforated.

In the dorſal vertebræ the ſpinal apophyſes, which are longer, are turned downwards; the tranſverſe apophyſes, inclined backwards, exhibit demi-facets, which when united form complete facets deſtined to receive the ends of the ribs; the 1ſt, the 11th, and the 12th, exhibit a complete facet. Theſe facets are turned downwards in the upper vertebræ, and upwards in the lower.

The lumbar vertebræ are the largeſt; their ſpinal apophyſes are exceedingly ſtrong, and turned backwards.

The different regions of the ſpinal and præſpinal face of the rachis or ſpine are alſo diſtinguiſhed by peculiar names.

Thus the region of the neck behind is called the *cervical*, and before the *trachelian*; that of the back behind, the *dorſal*, and before, the *prædorſal*; that of the loins behind, the *lumbar*, and before, the *prælumbar*.

The five pelvian vertebræ united into one piece

form the *os ſacrum*; this bone is flat, triangular, and concave before; its broad and thick ſummit is united by its body and articular apophyſes to the laſt vertebræ of the back; it is articulated on the ſides with the bone of the pelvis, and on the lower part it receives the *coccyx*.

The *os ſacrum* exhibits on the fore part the bodies of the vertebræ of which it is formed, and behind and on the ſides confuſed tubercles, which correſpond to the ſpinal, tranſverſe and articular apophyſes. This bone contains alſo the vertebral canal; the foramina which terminate there are placed before and behind.

The laſt three or four vertebræ, united into one, form a ſmall bone called the *coccyx*, which terminates in a point, and is articulated with the *os ſacrum*, on which it can be bent backwards. In this bone the form of the vertebræ which compoſe it can ſcarcely be diſtinguiſhed.

Between the articular ſurfaces of the bodies of the vertebræ is found a white, thick, firm and elaſtic ſubſtance, the conſiſtence of which decreaſes from the circumference to the centre; this ſubſtance, which is of a fibrous ſtructure, adheres ſtrongly to the two contiguous vertebræ, and is called *the ligamento-cartilaginous*.

The bodies of the vertebræ are covered, both before and behind, with a tiſſue of white compact fibres, exceedingly ſolid, which proceeds along the whole

whole rachis or ſpine, and which iscalled the *common vertebral ligament, poſterior and anterior.*

On the poſterior part of the ſpinal canal, and between the articular apophyſes, there are exceedingly ſtrong ligaments called the *intermellar (yellow ligaments).*

The vertebræ are faſtened alſo behind by a ligament (the *ſuperſpinal),* which proceeds along the ſpinal apophyſes, and by ligaments *(interſpinal)* which extend from one ſpinal apophyſis to the other. Each articular apophyſis has alſo a ſtrong *capſular ligament,* which is united to the neighbouring vertebra*.

The means by which the laſt lumbar vertebra is united to the os ſacrum are the ſame as thoſe by which the vertebræ are united; and the coccyx is fixed to the os ſacrum by an articular capſule and ligaments placed before and behind.

The vertebral column is ſlightly bent, in ſuch a manner that the region of the neck before is convex, that of the back concave, the region of the loins convex, and that of the *os ſacrum* concave.

Though each vertebra can perform on the other

* All the articular ſurfaces of theſe bones, which form moveable articulations, are covered with a ſtrong, ſmooth, and moiſt cartilage, and the portions of the bone articulated are always wrapped up in a ſort of membrane which ſurrounds the articulated ſurfaces in the form of a *capſule,* and keeps them firm. This arrangement being always the ſame, we ſhall diſtinguiſh it in future by the name of the *articular capſule.*

only

only very confined movements, the whole of theſe movements is complete in the whole of the ſpine; and it is well known how far thoſe who exhibit feats of tumbling can carry the pliability of this part. It is by means of the lumbar vertebræ in particular, that the greateſt movements of the trunk are performed, becauſe they are not impeded in their motion, like that of the back, by being united to ribs.

The body of the vertebræ conſiſts of a ſpongy ſubſtance; that of the apophyſes is of a more compact texture.

5. THE RIBS AND STERNUM IN ANIMALS. In almoſt all animals the ribs are ſuſtained by a greater or leſs number of vertebræ. Theſe bones, however, are wanting in many cartilaginous fiſhes; in ſome of the oſſeous, and in frogs.

The number of the ribs, which varies from 12 to 23 on each ſide in the *mammalia*, is conſiderably increaſed in ſerpents and ſome fiſhes, which have almoſt as many as they have vertebræ.

In the ſalamander, and ſeveral genera of fiſhes, the ribs are very ſhort; in ſome of the mammalia they are exceedingly long. In the herring they are as ſmall as needles; and in the two-toed ant-eater *(myrmecophaga didactyla)* ſo long that they cover each other like tiles.

In general they are ſingle; in ſeveral fiſhes however they are forked, ſo that two proceed ſometimes from the ſame vertebra.

The

The ribs are ſeldom ſtraight, being for the moſt part bent almoſt in a ſemicircular form; in the mammalia their configuration determines the form of the thorax, and in fiſhes and ſerpents that of the belly and *abdomen*.

One of the extremities of the ribs always reſts on the vertebræ; the other either remains ſuſpended in the ſoft parts, or is united with a cartilage, or reſts on a bone called the *ſternum**.

The name of *ſternal* vertebræ is given to thoſe which on one ſide adhere to the vertebræ, and on the other to the ſternum; and that of *aſternal* to thoſe which do not reach the ſternum.

In mammalia the ribs which end at the ſternum are towards the head: birds, in general, exhibit a contrary diſpoſition; ſometimes, however, they have aſternal ribs towards the head, and towards the pelvis. In animals which have no ribs † the ſternum is wanting; ſerpents and almoſt all fiſhes have ribs, without having a ſternum.

In mammalia the ſternum is long, of conſiderable thickneſs, broader or narrower, oſſeous, ſometimes cartilaginous, and, for the moſt part, conſiſts of ſeveral pieces. In birds it is exceedingly broad as well as thin, and preſents a very ſalient ridge, particularly in thoſe of a rapid flight. In ſome reptiles it aſſumes very ſingular forms, is extremely ſmall, and in fiſhes is always wanting.

* In the crocodile the ventral ribs reſt on the *os pubis*.

† Frogs excepted.

6. Ribs

6. Ribs in man. In man the ribs are in number 12 on each ſide; theſe bones are long, bent irregularly in a ſemicircular form; are flat, and, as it were, twiſted backwards.

At the poſterior extremity they preſent a double facet, ſeparated by a ſalient line; this facet is articulated between the lateral parts of two vertebræ. At the diſtance of an inch from this extremity, the ribs have behind another facet, which is applied to the tranſverſe apophyſis of the loweſt vertebra. Theſe two articular facets are ſeparated by a narrow part or ſtricture called the *neck* of the rib.

The ribs then proceed backwards and outwards, after which they ſeem to bend in order to proceed forwards, and exhibit there a ſalient line nearer the vertebræ in the upper ribs: *angle of the ribs.*

The anterior extremity is terminated by a cartilage which unites with the ſternum; the firſt ſeven ribs *(ſternal ribs)* proceed in this manner to the ſternum, by means of an intermediate cartilage; but the cartilages which terminate the laſt five *(aſternal ribs)*, reſt one upon the other, and are ſupported by the cartilage of the ſeventh rib.

The firſt rib, which is ſhorter as well as broader, has its external face turned upwards; the following ones become longer, and their external faces are directed forwards: in the laſt place, the lower ones become ſhorter, and obſerve the ſame direction.

The

The articulation of the ribs with the bodies of the vertebræ is fecured by an articular capfule, an *anterior ligament*, a *cofto-tranfverfe ligament*, and an *interior ligament*. The tuberofities of the firft ten ribs are faftened to the tranfverfe apophyfes of the correfponding vertebræ, by a *capfule* and a *tranfverfe ligament*.

7. *The fternum*. The fternum in man is a flat bone, broad at the top, and terminating at the bottom in a thin cartilage of greater or lefs extent. This bone often confifts of two pieces, which in the courfe of time coalefce and adhere together; on the fides it has facets proper for receiving the cartilages, which terminate the ribs; thefe cartilages are retained on the fides of the fternum by an *articular capfule*, an *anterior* and a *pofterior ligament*.

The fternum is exceedingly fpongy; it is covered both without and within by a very ftrong *periofteum*.

The fternum, the ribs, and the dorfal vertebræ, form the capacity of the thorax.

The thorax has the form of a very irregular cone, with its bafe truncated downwards and its fummit upwards; it is flat before, broad and rounded on the fides; flat and concave behind.

OF

OF THE HEAD.

THE head, with reſpect to its form, is that part of animals moſt liable to variation. It conſiſts of the cranium and face.

8. CRANIUM OF ANIMALS. The cranium, or *cephalic cavity*, contains the brain.

The differences obſerved in the form of the head of various animals conſiſt chiefly in the greater or leſs contraction of the ſize of the cranium, and the greater or leſs elongation of the face.

The extent of the cranium, in regard to the elongation of the face, may be determined on the ſurface preſented by a vertical ſection of the head: it is obſerved, in the different claſſes of the mammalia, that the cranium occupies on this ſurface an extent either greater or ſmaller than or equal to that of the face, without including the lower jaw. Among the Europeans the extent of the cranium is nearly quadruple that of the face; in the Negro, the extent of the cranium remaining the ſame, that of the face is increaſed by a fifth.

In the different ſpecies of apes, the area of the face goes on increaſing; in the mandril *(ſimia maimon)*, and the greater part of carnivorous animals, it is nearly equal to that of the ſkull; in various ſpecies of graminivorous animals it continues to increaſe to ſuch a degree, that in the horſe it is almoſt four times as large as that of the cranium.

The cranium affects different forms; but for the moſt part the ſummit of it is oval or rounded, and its baſe an irregular plane.

The bones of the cranium do not ſeem to be numerous in fiſhes; in theſe animals they are united by plane ſurfaces, coaleſce at an early period, and leave few traces of their junction. In birds theſe bones, which are fitted into each other by ſutures, coaleſce alſo at an early period, and the traces of their articulations diſappear with age. But in the greater part of the mammalia, and in man, theſe oſſeous pieces are very diſtinct, and at moſt are eight in number, viz. before, the *frontal* bone; on the ſummit and at the ſides, the two *parietal* bones; lower, and on the ſides, the two *temporal* bones; behind, the *occipital*; and at the baſe, the *ſphenoid*, and the *ethmoid*. Of theſe bones the frontal, ſphenoid, and ethmoid, are common to the cranium and face.

Theſe bones, in the various genera of animals, differ both in regard to their form and relative ſize; and it may thence be eaſily conceived in how

how many ways the configuration of the cranium may be varied.

The cavity of the cranium in the mammalia is filled with the brain; but in reptiles and fishes this organ occupies only a very small part of it.

9. Cranium in man. In man the cranium is round, well expanded, and presents a cephalic cavity comparatively larger than that of other animals: it consists of eight bones.

10. The *sphenoid, os sphenoides.* The sphenoid is a bone of a very singular form; it is long, and passes through the middle of the base of the cranium and the breadth of the face; it exhibits a great number of prolongations, by means of which it is articulated with all the bones of the cranium, and a great part of those of the face*.

On account of its position and numerous connections, it has been considered as the key of the

* This bone has on each of its sides two unequal prolongations, called the *greater* and *less alæ,* or wings; at the bottom two apophyses, called the *pterygoides,* which form behind a *fossa,* called the *pterygoid.* The middle of this bone is the body of it, the upper part of which, transversally depressed, is known under the name of the *sella turcica,* and is surrounded by the *anterior* and *posterior clinoid apophyses.* This bone is perforated with holes, which afford a passage to the vessels and nerves; viz. the optic foramina, the sphenoidal fissures or *rimæ,* the upper and lower maxillary foramina, and two spinous foramina. In the thickness of the body the sphenoid fissures are contained.

 bones

bones of the head. This bone is ſeen at the baſe and on the ſides of the cranium; it concurs to form the cavities of the eyes *(orbits)* and thoſe of the noſtrils.

11. *Frontal bone, Os frontis.* The anterior part of the cranium, or the forehead, is formed by the *os frontis.* This bone forms alſo the upper part of the face; it is curved and rounded at the ſummit, and before and on the ſides it is furniſhed with two proceſſes called the *frontal*, and in the middle, lower down, with two other proceſſes called the *naſal.* The lower part of it is bent back in a horizontal direction: it is indented in the middle to receive the *os ethmoides*, and its ſides are arched to form the upper part of the cavities that contain the eyes.

This bone is articulated below with a part of the bones of the face; behind and at the bottom with the *os ſphenoides*, and behind and at the top with the two following bones.

12. *Parietal bones.* The ſummit and ſides of the cranium are formed by the junction of the two parietal bones. Theſe bones are convex on the outſide, quadrilateral and ſerrated at the edges; they articulate with each other above, with the frontal bone before, with the occipital behind, and at the bottom with the temporal bones and the ſphenoid.

13. *Occipital bone, Os baſilare.* The back of the

head

head and a part of the baſe of the cranium are formed by the occipital bone. This bone is convex on the outſide, and is ſhaped ſomewhat like a lozenge; two of its edges are fitted by a ſuture into thoſe of the parietal bones; it preſents on the outſide behind a protuberance called the *occipital*; on the ſides two ſalient lines called the *occipital arch*, and within two grooves, correſponding to theſe two lines. Below is the large *occipital foramen*, which forms a continuation with the vertebral canal; on the ſides and within this hole there are two *tuberoſities*, with which the head is articulated on the vertebral column: in the laſt place, that part of the bone before this hole is called the *ſub-occipital.*

This bone has ſeveral holes alſo for the paſſage of the nerves and veſſels: it is articulated before with the ſphenoid; at the bottom with the *rachis* or ſpine, and on the ſides with the following bones.

14. *Temporal bones, Oſſa temporalia.* Below and on the ſides the cranium is formed by the two *temporal bones.* Theſe bones are of a very irregular figure; they preſent on the outſide a flat, rounded, and very thin part, which may be compared to the ſhell of an oyſter. This part gives birth on the outſide to an *apophyſis*, called the *zygomatic*: it is long and thin; proceeds forwards, receding from the bone, and unites with the apophyſis of another bone to form an arch.

Below the root of this apophyſis is the *glenoid cavity*, which receives the condyle of the jaw-bone: beyond this cavity is the external orifice of the *meatus auditorius*; and ſtill further back is a large tuberoſity called the *apophyſis maſtoideus*. Below the auricular foramen is the apophyſis *ſtyloides*, behind which is obſerved the *jugular foſſa*.

The temporal bone preſents, in the inſide, a thick part, very unequal and exceedingly hard, called the petreous *(petrea)*. It is in the thickneſs of this part that the organs of hearing are contained. The temporal bone exhibits a great number of holes, the principal of which are: below, the *ſtylo-maſtoid*; the carotid canal, and the guttural conduit of the ear; in the inſide, the interior auditory foramen.

This bone is articulated before with the ſphenoid; at the top with the parietal bones, and behind with the occipital.

15. All theſe bones of the cranium are fitted into each other by ſutures, or are united by ſmooth ſurfaces. Their edges are generally cut obliquely in different directions: the ſame bone, therefore, has a part of its edge cut into a bevel on its external face, while in another part it is cut into a bevel on the internal face. This peculiar diſpoſition exhibits a method of articulation as ſtrong as it is wonderful.

 Thoſe

Thoſe ſerrated marks produced by the junction of the bones of the cranium, and which are called *ſutures*, become effaced ſometimes with age.

The bones of the cranium exhibit, on the outſide, particularly behind and on the ſides, depreſſions or aſperities, that indicate the inſertion of the muſcles by which theſe parts were covered.

In different points of the bone of the cranium there are holes of greater or leſs ſize, which penetrate to the inſide of it, and which afford a paſſage to the veſſels and nerves.

The upper part of the cavity of the cranium exhibits furrows of greater or leſs depth, which extend in a ramified form: theſe furrows correſpond to veſſels which reſted directly againſt the ſides of this cavity.

The baſe of the cranium preſents, in the inſide, eminences and excavations very diſtinct: the cavities ſerve to lodge portions of the cerebral organ.

The lower part of the cephalic cavity, the baſe of the cranium and the ſides of the head contain holes, fiſſures, and indentations, which afford a paſſage to the nerves, arteries, and veins*.

The

* The inferior ſide of the cavity of the cranium, proceeding from the fore part backwards, preſents the *foramen cæcum*, the holes with which the cribriform plate of the *os ethmoides* is perforated, the optic foramina, the ſphenoid fiſſures, the upper maxillary or large round foramina, the lower or oval maxillary foramina,

The bones of the cranium are covered throughout their whole extent, both internally and externally, by a membrane which ſtrongly adheres to them, and is called the *pericranium.*

16. THE FACE IN ANIMALS. It is of importance to examine the face in the different claſſes of animals, in regard to its greater or leſs elongation.

The form and elongation of the face are always determined by the greater or leſs prolongation of the jaw-bones.

It is obſerved, in general, that the perfectibility of the organization of animals is in the inverſe

foramina, the ſpinous or ſmall round foramina, the internal orifice of the carotid canal, the poſterior foramina lacera, the anterior foramina lacera, the interior auditory foramina, the poſterior foramina lacera, the anterior condyloid foramina, (the poſterior condyloid, and the maſtoid foramina when they exiſt,) the grand occipital foramen.

The baſe of the cranium preſents: the anterior palatine foramina, the poſterior palatine foramina, the poſterior aperture of the naſal foſſæ, the poſterior aperture of the palatine and pterygoid conduits, the anterior foramina lacera, the carotid canal, the poſterior foramina lacera, the anterior and poſterior condyloid foramina, and the grand occipital foramen.

The lateral parts of the head preſent: the external orifice of the auricular conduit, the ſtylo-maſtoid foramina, the ſpinous foramen, the foramen ovale or lower maxillary foramen, and the zygomatic foſſa, in which are found: the ſpheno-maxillary rima or fiſſure, the orifice of the ſub-orbitar, palatine, pterygoid, ſpheno-palatine, and pterygo-palatine conduits.

 ratio

ratio of the ſmall ſize of the cranium, and of the great elongation of the jaw-bones.

Man, of all animals, has the largeſt cranium and the ſhorteſt face.

To determine the ſize of the facial angle, Camper raiſes above the plane of the baſe of the cranium a line, which, proceeding from the bottom of the upper inciſive teeth, is continued in an inclined direction to the moſt prominent part of the forehead. The plane of the baſe of the cranium paſſes through the anterior edge of the upper part of the noſtrils, and through the auditory foramina. The facial angle, therefore, in European heads, in general, is equal to eighty degrees; in thoſe of the Moguls to ſeventy-five; in thoſe of the negroes to ſeventy; in the orang-outang to ſixty-five; and in carnivorous and graminivorous animals it decreaſes ſo much, that in the horſe it does not exceed twenty-three degrees.

This meaſurement, however, can be applied with any degree of exactneſs only to the human ſpecies and the *quadrumana* *. Other animals often preſent ſuch ſingular configurations of the head, and ſuch projections of the forehead, that it is not poſſible to meaſure their facial angle: beſides, it is of little importance to obſerve the ſize of the

* *Quadrumana*—animals with four hands: a name given to the ſecond order of the *mammalia* in Blumenbach's *Handbuch der Naturgeſchichte*. The ſpecies included under this denomination are: Simia, Papio, Cercopithecus, Lemur. In the older works this order were called *Pitheci*. TRANS.

head,

head, except in regard to the volume of brain it is ſuppoſed to contain: in reptiles and fiſhes the brain occupies only a ſmall portion of the cavity of the head.

The Greeks ſeem to have been ſenſible that the beauty of the head conſiſts, in an eſſential manner, in a ſtraight direction of the face. In the ſtatues of the gods or heroes whom they were deſirous of ranking among their deities, it is ſeen that they increaſed beyond the limits of nature this angle, which they ſometimes carried to nearly a hundred degrees, as if they wiſhed by theſe means to give them a form of countenance as far diſtant as poſſible from that of the common race of men.

It is obſerved, indeed, that the ſtraight form of the face generally pleaſes even in animals; and, on the other hand, that elongation of the muzzle and depreſſion of the cranium give them always a ſtupid and ferocious air.

17. Face in man. In man the face has ſuch a direction that the eyes and mouth look directly forwards: the bones which compoſe it are in number fifteen, beſides the thirty-two teeth.

18. Bones of the nose. The bones of the noſe are ſmall, oblong, and quadrilateral; they coaleſce, and thus form the upper part of the noſe; they reſt laterally on two prolongations of the upper jaw-bone; at the top they are indented

into the frontal bone and the *os ethmoides*; their lower edges being free are united with the cartilage of the noſe.

19. *Lachrymal bones.* On the interior ſides of the orbits there are two ſmall thin bones, called the lachrymal bones. Their exterior face exhibits a portion of the *foſſa lachrymalis*, which has a communication with the noſtrils.

Theſe bones are articulated: at the top, with the frontal bone; before and below with the upper jaw-bone, and behind with the *os ethmoides* and the lower cornets.

20. *Zygomatic bones.* On the external and lower ſide of the orbits there are two ſmall bones, called *Zygomatic bones*, of a very irregular form, flat, and ſomewhat convex on the outſide. Their circumference conſiſts of four indented ſides, terminated by pretty long angles, called *apophyſes*.

Theſe bones are articulated: by the upper apophyſis, with the *os frontis* and *os ſphenoides*; before and at the bottom with the upper jaw-bone. The poſterior apophyſis, being longer, is united with that which, as already ſaid, riſes above the temporal bone, and forms with it an *arch*, called the *zygomatic*.

21. *Super-maxillary bones.* At the middle and anterior part of the face are the two bones of the upper jaw, or the *ſuper-maxillary* bones: theſe bones are each very irregular, and preſent, in their

thickneſs,

thicknefs, a cavity called the *finus maxillaris*, which has a communication with the noftrils.

The fuper-maxillary bone is connected with all the bones of the face, and with a part of thofe of the cranium. It is articulated: in the infide and at the bottom with its fellow, and two other bones; before and at the top it has an afcending apophyfis, called the orbito-frontal, which refts on the frontal, the lachrymal and the ethmoid bone, and which fupports the bones of the nofe: at the bottom and on the outfide of this apophyfis is the anterior orifice of the fub-orbital conduit: on the outfide it is united to the *zygoma* and the *os fphenoides*: before and below it receives the teeth.

Thefe bones conftitute a great part of the face and palate; they contribute to form the arch of the nofe, the fides of the noftrils and thofe of the orbits; they receive the upper teeth, and ferve for maftication.

22. *Bones of the palate.* Behind the fuper-maxillary bones, and at the bottom of the noftrils, are the palatine bones, which extend as far as the orbits. Thefe bones are of a very fingular form, which is neceffary that they may adapt themfelves, in a great part, to the ftill more fingular form of the *os fphenoides*.

Thefe two bones unite behind the fuper-maxillary bones: they are articulated with the *os fphenoides*, the *os ethmoides*, and the lower cornets (turbinated bones), and with an offeous plate.

23. The

23. The *os ethmoides*. In the inſide, and at the ſummit of the noſtrils, under the indentation of the frontal bone, is the *os ethmoides*, of a cubic and elongated form, exceedingly light, and conſiſting in the inſide of very thin plates, pierced with holes, which aſſume different directions, and form a great many cells communicating with each other.

The upper face of this bone, which is of a more compact nature than its interior plates, is pierced with about forty holes: it correſponds on the inſide to the baſis of the cranium, and in the middle preſents a *ridge*. Its compact lateral faces concur to form the internal ſides of the orbits. The other faces of this bone are open, and correſpond to the ſummit of the noſtrils.

This bone is articulated: at the top with the frontal bone; before, with thoſe of the noſe, the ſuper-maxillary bones and the lachrymal; behind, with the *os ſphenoides* and the palatine bones; at the bottom and in the middle with an oſſeous plate.

24. *Lower cornets*. *Turbinated bones*. Beneath, and on the ſides of the *os ethmoides*, are two bones, formed of plates twiſted into the form of cornets: theſe bones ſeem to be an appendix of the *os ethmoides*, and are united to it. Theſe cornets are articulated alſo with the ſuper-maxillary bones, the lachrymals, and the palatine bones.

25. The *vomer*. Between theſe two cornets, below

below the *os ethmoides*, and in the middle of it, is an offeous plate, which divides the nafal foffæ into two noftrils, and is called the *vomer.* This thin and long bone receives in a groove, on its anterior and fuperior edge, a cartilage, which completes with it the partition of the noftrils. It refts at the bottom, between the two fuper-maxillary and the palatine bones, and is joined at the upper part, in the bottom of the noftrils, to the middle of the *os fphenoides*, by a large furrow.

26. JAW-BONE. The lower jaw-bone, *os maxillare*, is formed of a bone turned round on its plane face, in the form of a horfe-fhoe: the upper edge of the arc contains fixteen cavities for receiving the teeth; the lower edge has a projection towards the *chin.*

Behind and in the middle of this bone is a fmall ridge, called the *genian*; on the fides of which are two falient lines, known by the name of the *mylean*, which terminate at the orifice of the dental canal.

The extremities of the maxillary bone are bent up and backwards, fo as to make an angle of forty-five degrees, and terminate in a flattened tranfverfe tuberofity, called the *condyle*, which is received in the articular cavities of the temporal bones. Before this tuberofity is a large apophyfis, called the *coronoid*, feparated from the condyle by a deep indentation.

The

The articulation of this bone with the temporal is ſecured by a lateral external ligament, a lateral internal, a tylo-maxillary ligament, and an articular capſule.

Mammalia, fiſhes, and many reptiles, have jaw-bones armed with teeth. (*See that part of the article on Digeſtion.*)

27. The bones of the face, as well as thoſe of the cranium, are connected by means of ſmooth ſurfaces or indentations, and exhibit the ſame peculiarities. Theſe bones have alſo depreſſions or aſperities in thoſe places to which the muſcles were attached, and holes through which the veſſels and nerves were conveyed to the interior parts.

The aggregate of the bones of the face, together with thoſe of the cranium, ſeem fitted in a ſpecial manner, by the formation of the cavities of the ear, the orbital foſſæ, the naſal foſſæ, and thoſe of the mouth, for receiving the organs of hearing, of ſmell, and of taſte.

The aggregate of the bones of the cranium and face exhibit alſo externally ſome remarkable parts, to which it is of importance that particular names ſhould be aſſigned, in order that they may be diſtinguiſhed with greater facility. Thus the cranium has on each ſide a large depreſſion called the *temporal foſſa*, the lower end of which terminates near the zygomatic arch: below this arch is another

another cavity of leſs breadth, but much deeper, known by the name of the *zygomatic foſſa* *.

28. Articulation of the head. The head, in different animals, is articulated on the vertebral column by one or two condyles.

In birds, it is articulated behind by a ſingle condyle, which allows it to perform ſuch extenſive motion, that theſe animals can turn their beaks directly behind them: it is well known that they often ſleep with their heads reſting in this manner between their wings. A part of the oviparous quadrupeds have only one occipital condyle. Serpents have a condyle with three facets, diſpoſed in the form of a trefoil leaf, which admits of few movements. Moſt fiſhes have only one condyle,

* If the face be examined from the top downwards, we obſerve the holes of the eye-brows and the orbital foſſæ. In the orbital foſſæ are found the ocular holes, the ſphenoidal and ſpheno-maxillary fiſſures, the internal orbital foramina, and the orifice of the naſal canal. Below and between the orbital foſſæ the face preſents the aperture of the naſal foſſæ. In theſe foſſæ are ſeen the holes of the cribriform plate of the os ethmoides, the apertures of the ſphenoidal ſinuses and of the poſterior ethmoidal cellules; the aperture common to the anterior ethmoidal cellules and the frontal ſinuses; thoſe of the maxillary ſinuses; the ſpheno-palatine foramina; the orifices of the anterior palatine conduit. On the ſides of the noſe, the face exhibits alſo a foſſa called the *canine*, in which is ſeen the ſub-orbital foramen; and below, the face exhibits the dental arches and the orifices of the dental canals.

articulated

articulated by means of cartilages, and which poſſeſſes very little mobility. The ray and ſhark have two condyles, the movements of which are very confined. In the laſt place, the mammalia are furniſhed with two condyles, more or leſs moveable.

In man, the head is articulated on the vertebral column, by means of two tubercles or *condyles*, placed on the ſides of the large occipital foramen. Theſe condyles are fitted into two articular cavities ſituated on the interior ſides of the arch of the firſt vertebra.

This diſpoſition of the articular faces permits the head to perform, with eaſe, every motion of flexion and extenſion, backwards and forwards; and eaſy movements of flexion and rotation on the ſides.

But the movements of rotation performed by the head are owing, in a great meaſure, to thoſe performed in the ſame direction by the firſt vertebra on the ſecond; and the different motions which the vertebræ perform on each other contribute greatly alſo to thoſe of the head.

The articulation of the head is ſecured by an *anterior ligament*, a *poſterior ligament*, and an *articular capſule.*

The peculiar articulation of the ſecond vertebra on the firſt, by means of the odontoid apophyſis of the latter on the anterior arch of the former, is ſecured

ſecured by a *tranſverſe ligament*, two *lateral ligaments*, an *acceſſory ligament*, and a *capſule*.

The middle of the head is not placed exactly on the vertebral column, and Camper has obſerved that the part which is before the large occipital foramen is to that behind in the ratio of eight to ſeven; ſo that the head, when not kept back, has a ſlight tendency to fall forwards.

In the vertical poſition of the head, man alone has the mouth and eyes looking directly forwards.

We have already ſeen that the trunk and head conſiſt of bones, ſome of which have always their fellow, while others are conſtantly ſingle. The ſingle bones are always ſymmetric, that is to ſay, can be divided into two ſimilar parts: theſe are neceſſarily placed in the centre. Bones which have fellows are always placed one on the right and the other on the left, and never have a ſymmetric form; ſo that in the ſkeleton one ſide has a perfect reſemblance to the other.

OF

OF THE LIMBS.

29. Limbs in animals. The ſkeleton of ſerpents and fiſhes conſiſts of the trunk and the head only; but that of oviparous quadrupeds, birds, and the mammalia, is provided with four limbs, which ſeem always to be formed according to an uniform plan.

The fins of fiſhes, properly ſo called, are parts which ſupply the place of limbs; but they cannot be conſidered as ſuch, becauſe their ſtructure has nothing in common with that of limbs.

Cetaceous animals, which are not fiſhes but amphibious mammalia, have no fins: their place is ſupplied by limbs, which diſcharge the ſame functions.

The limbs of all animals are conſtantly fixed, ſome to the breaſt or *thorax*, and others to the *pelvis*; on which account they are diſtinguiſhed into *thoracic* and *pelvian*.

Thoracic Limbs.

30. Thoracic limbs of animals. The thoracic limbs of animals are the ſhoulder, the arm, the fore-arm and the hand; the pelvian are the haunch, the thigh, the leg, and the foot.

The

The other limbs vary in the different orders of animals, with reſpect to their form, their length, their covering, and in particular their termination. This variety determines the uſe for which they are proper.

31. Shoulder in animals. The ſhoulder conſiſts ſometimes of one bone called the *ſcapula* (*omoplata*), as is the caſe in the mammalia with ſolid hoofs. It is often formed of two bones, the *ſcapula* and the *clavicle*; as in the quadrumana, ſome carnivorous animals, and the greater part of oviparous quadrupeds. In birds it conſiſts of three bones, viz. the ſcapula, the clavicle, and the fork.

The ſhoulder has always a cavity which receives the head of the bone of the arm. This cavity, for the moſt part, is contained in the ſcapula; ſometimes it is formed both in the ſcapula and clavicle; and in birds the three bones of the ſhoulder concur towards its formation.

The ſcapula is generally a broad, flat bone, ſituated at the dorſal part of the ribs; but its figure greatly varies in different animals: in the mole it is exceedingly long; in the frog and the toad it conſiſts of two pieces.

The clavicle, for the moſt part, is a long thick bone, reſting on one ſide on the top of the ſternum, and on the other againſt the ſcapula, which it

 fixes

fixes and keeps back. All animals provided with this bone can extend their thoracic limbs forwards, with more or lefs facility to perform great motions.

Animals which have no clavicle employ their thoracic limbs only for walking. Some carnivorous animals, fuch as dogs and cats, &c. have the clavicular bones fufpended in the flefh, and altogether ufelefs.

The forked bone in birds has the form of the letter V; it ferves, together with the clavicle, to keep the fcapula firm, and to prevent it from advancing too far forwards: birds which have this bone exceedingly ftrong fly, in general, with great rapidity.

The fhoulder of the tortoife confifts of three bones, analogous to thofe of birds: thefe bones coalefce, and form only one offeous piece.

The fhoulder, in man, confifts of the fcapula and the clavicle.

32. The *fcapula.* The fcapula is a flat, thin, triangular bone, placed at the top of the back behind, having one of its angles elongated and directed downwards.

Its external face has, at the upper part, a projecting apophyfis, running acrofs it, which is prolonged outwards by a large tuberofity flattened from the top downwards, and on the fide of which the clavicle refts. This apophyfis is called the

acromion:

acromion: its upper edge is diftinguifhed by the name of *fuper-acromian*, and the lower by that of *fub-acromian.*

The external angle of the fcapula, which is truncated and fwelled up, prefents a facet, to receive the head of the bone of the arm: above and within this facet is a very ftrong apophyfis bent forwards, and known by the name of the *coracoid.*

The fcapula is fecured by mufcles.

33. The *clavicle* is a long, round bone, bent into the form of an *f*: it is articulated on one part into the top and fides of the fternum, and on the other with the fide of the acromion apophyfis. The acromian extremity is united to the acromion by an *articular capfule*, and two *ligaments* (the *rhomboid* and *conoid*) which proceed from the coracoid apophyfis.

The fternal extremity is fixed to the fternum and the cartilage of the firft rib, by an articular capfule, a *cofto-clavicular* and a ftrong *inter-clavicular* ligament. This articulation has alfo an *inter-articular* ligament.

It is feen by this difpofition that the fhoulder is articulated with the trunk only by the extremity of the clavicle, which is united to the fternum; and that the fcapula can perform great movements by gliding on the thorax.

34. THE ARM. The arm, in all animals, con-

 fifts

fifts of only one bone, called the *humerus:* this bone varies with refpect to its proportion; it is exceedingly fhort in cetaceous animals, and very long in bats.

35. THE HUMERUS. The humerus of man has at its upper extremity a fmooth hemifphere, turned inwards and upwards *, by means of which it is articulated with the fcapula.

Around this hemifphere is a flight depreffion, which forms its neck; and on the back part of it there are two *tuberofities*, one larger than the other: the largeft is diftinguifhed by the name of the *trochiter*, and the fmaller by that of the *trochin:* they are feparated by a *groove.* The articular facet of the fcapula, which is narrow and almoft plane, is incrufted in a thick cartilage turned up at the edges, fo as to form a cavity proper for receiving the hemifpheric facet of the humerus: thefe bones are maintained in their proper pofitions by an articular capfule, which embraces the neck of the humerus, from the offeous and cartilaginous edge of the cavity of the fcapula.

The arm can perform on the fhoulder very free movements, in every direction.

* In defcribing the bones of the thoracic limbs of man, it is fuppofed, in regard to the refpective pofition of the different parts, that the limbs are extended along the body with the palm of the hand turned forwards.

The

The humerus becomes broader at the lower part: it is plane behind, convex before, and turned a little outwards: it is terminated on the fides by two tuberofities: the *interior*, which is larger and does not defcend fo low, is called the *epitrochlea*; the other is known by the name of the *epicondyle*. At the extremity of the bone there are two fmooth round furfaces, flightly hollowed into two grooves, feparated from each other by a projecting line: the interior moves around the bone, from the fore-part backwards, in the form of a pulley, *trochlea*; and is terminated before and behind by a cavity: the exterior is placed at the lower part before, and is called the *condyle*.

36. THE FORE-ARM. The fore-arm in fome animals, fuch as the bat, confifts of only one bone; in ruminating animals it appears to be formed of two bones which have coalefced: in the greater part of animals, and in man, it confifts of two diftinct bones, called the *cubitus* or *ulna* and the *radius*.

37. *Cubitus*. The bone of the elbow, which is flender and of a triangular fhape, becomes larger at the upper part, where it has a deep articular indentation of a femi-circular form, turned forwards and inwards, called the *fygmoid* cavity. The humeral extremity of this bone has on the back part an eminence, which forms the elbow or *ole-*

cranon: before, it has a larger one called the *coronoid*, and within a ſmall articular *facet* called the ſmall *ſygmoid cavity*: this articulation is ſecured by an *anterior* ligament, a *poſterior ligament*, two *lateral* ones, and a *capſule*.

The bone of the elbow is terminated below by a ſmall plane articular facet, on the interior ſide of which is an *apophyſis* called the *ſtyloid*.

38. *The radius.* The radius at the upper end has a ſmall articular facet, ſomewhat concave, the ſmooth internal edge of which is articulated with the ſmall ſygmoid cavity of the cubitus. Below the head it is much ſmaller, ſo that this part forms its neck. This bone becomes broader towards the lower end, and is terminated by an articular facet, lengthened in a croſs direction, and ſomewhat concave. On the exterior ſide of this bone is a *ſtyloid* apophyſis, and on the interior a ſmall articular facet, which correſponds with that of the *cubitus*.

The fore-arm is articulated on the arm by its two bones, which are articulated alſo with each other above and below.

The ſygmoid cavity of the cubitus embraces the articular facet of the humerus, which is ſhaped like a pulley, and gliding on it cauſes the fore-arm to execute great movements on the arm as if by a hinge. The olecranon placing itſelf in the cavity which is behind the pulley of the humerus, limits

limits the motion of extenſion; and the coronoid eminence by reſting againſt the cavity, which is before this pulley, fixes the movements of flexion.

The articular facet of the radius reſts againſt the rounded ſurface on the exterior ſide of the pulley of the humerus, and glides on that ſurface, accompanying the cubitus in its motions.

In its articulation with the humerus, the radius can turn on itſelf. This rotary motion takes place at the top againſt the external edge of the cubitus, and at the inferior end around that bone.

The bones which form the articulation of the cubitus are ſecured by an articular capſule, and two lateral ligaments.

The interſtice between the two bones of the fore-arm is filled up by a very ſtrong *interoſſeous* ligament. The two bones of the fore-arm are kept together alſo above by an *annular* ligament, and below by a capſule or *triangular* ligament.

39. The laſt part of the thoracic limb has received different names *, according to its particular diſpoſition; but in all animals it conſiſts of the *carpus*, the *metacarpus*, and the *phalanges*.

40. CARPUS. The carpus is compoſed of ſmall ſhort bones of an irregular figure, the number of which is variable. In birds it is formed of two bones in a row. The number of the bones of the

* It has been called hand, paw, hoof, paſtern, baſtard wing, fin, &c.

carpus varies in the mammalia from 5 to 10, which are always diſpoſed in two rows.

In oviparous quadrupeds, moſt of the batrachians have the carpus formed of eight bones in three rows.

41. METACARPUS. The metacarpus conſiſts of longiſh bones, the number of which varies from 1 to 5; but in general it is equal to that of the fingers.

In ruminating animals and the *ſolipeda* the metacarpus conſiſts of a very long bone, which conſtitutes the cannon bone. This bone ſeems to add to the limbs of theſe animals one part more, which in them is generally taken for the fore-leg.

The metacarpus of birds is formed of a bone with two branches united. In cetaceous animals the bones of the metacarpus are united and flattened.

42. THE PHALANGES. The phalanges are thoſe longiſh bones which form the fingers. Sometimes they have the appearance only of imperfect rudiments; the perfect phalanges form fingers, which remain concealed under the ſkin, or are covered by lax membranes, or are enveloped in a carneous matter, or form externally ſeparate and diſtinct fingers.

Animals have never more than five fingers, each of which conſiſts, at moſt, of three phalanges; and the thumb has never more than two. The ſolipeda have only one perfect finger, which is known by the name of the paſtern, coronet or coffin-

coffin-bone. Ruminating animals have two fingers, ſupported by the bone of their metacarpus which forms the cannon bone. The three-toed ſloth has three fingers. Several animals with ſolid hoofs have four fingers, as the ſwine, the tapir, and the hippopotamos. In the laſt place, five fingers are obſerved in moſt carnivorous animals, in apes, and in man.

In bats, the extremity of the laſt phalanges, which are very long, terminates in points without claws*: it is ſometimes enveloped in a corneous ſubſtance, as in ruminating animals and the ſolipeda: it terminates in *fixed* claws in dogs, and *retractile* claws in cats: in apes and in man it is enveloped by the ſkin, and covered with a flat nail.

Birds have a large finger with two phalanges, and a pointed bone which ſupplies the place of a thumb: theſe two fingers, as well as the bone of the metacarpus which ſupports them, ſerve for bearing feathers †.

The thumb is formed of one or two phalanges; compared with the other fingers it is generally ſhorter: in carnivorous animals it is of the ſame length, and in the phocæ longer: in apes, and in man, the thumb is free, and can be oppoſed to

* Except the thumb, which remains ſhort and nail-like.

† The thumb bears the baſtard feathers, and the large finger as well as the metacarpus bears the primary feathers.

the

the other fingers; this diſpoſition forms the character of the hand.

Theſe different conſtitutions of the extremity of the thoracic limb enable animals to employ it differently; and their habits, in this reſpect, are always the reſult of the peculiarities obſerved in the organization of this part.

43. THE HAND OF MAN. In man the hand is compoſed of the carpus, the metacarpus, and the fingers.

44. The *Carpus*. The carpus of man is formed of eight bones*, diſpoſed in two rows: the two of the firſt row towards the thumb are received in the articular facet of the bone of the radius; the third is united to the bone of the cubitus; and the fourth reſts on the interior ſide of the third. The bones of the ſecond row are articulated above with thoſe of the firſt, viz. the two towards the thumb with that which is above; the third with the ſecond and third; and the fourth with the third: all the bones of the carpus are articulated alſo with each other on the ſides.

The bones of the carpus being articulated on

* Each of theſe bones is diſtinguiſhed by a particular name. Thoſe of the firſt row counting from the thumb are: 1ſt, os ſcaphoides; 2d, os ſemi-lunare; 3d, os cuneiforme; 4th, os piſiforme. Thoſe of the ſecond row, taken in the ſame direction, are; 1ſt, os trapezium; 2d, os trapezoides; 3d, os magnum; 4th, os unciforme.

thoſe

thofe of the fore-arm, muft follow the movements which the latter perform on each other. Thus the bone of the radius is articulated above with the humerus, and can turn on itfelf by gliding on the fide of the fygmoid cavity: below, this bone of the radius is articulated on the exterior fide of the fmall head of the os cubitus, around which it turns by moving forwards, and the radius croffes before the bone of the cubitus, in the form of a faltire, defcribing below an arc, the fize of which is determined by the breadth of the bone in that place.

In this motion of the radius the carpus, which on the one fide is articulated with it by its firft two bones, and which on the other is united to the bone of the cubitus by its third, is carried forwards and inwards by the radius; and in this movement it turns on the extremity of the os cubitus as on a pivot. It is thus that the movements of *pronation* and *fupination* are performed.

The articulation of the three bones of the carpus with the two bones of the fore-arm is enveloped by an *articular capfule*; this articulation contains a triangular cartilage, and is fixed by an *anterior ligament*, a *pofterior* and two *lateral ligaments*.

The fecond row of bones of the carpus is alfo fixed to thofe of the fecond by an articular capfule; and the bones of the carpus are connected by

by ligamentous fibres exceedingly varied, which extend from the one to the other.

45. *Metacarpus.* The five bones of the metacarpus in man are long, and ſomewhat convex behind; on the upper extremity they have a facet for their articulation with the bones of the carpus; and on the ſides there are other ſmall facets for uniting them to each other: their inferior extremity is terminated by a round head, which is received by the phalanges.

The three firſt bones of the metacarpus are articulated with the three firſt of the ſecond row of the carpus; the laſt two are articulated with the fourth.

The articulation of the bones of the metacarpus with the bones of the carpus is ſecured by an articular capſule; and by ligaments which proceeding from the ſecond row of the bones of the carpus are fixed at the baſe of the bones of the metacarpus: theſe ligaments are numerous, exceedingly varied, and placed before, behind, and on the ſides.

46. *Fingers.* The five fingers of man are each formed of three phalanges, except the thumb, which has only two.

The firſt *phalanges* are longer, and at the upper end have articular facets which receive the heads of the bones of the metacarpus; and at the lower end round proceſſes which are received by the facets of the following phalanges *(phalangines)*. In the

the laſt place, thoſe which terminate the fingers *(phalangettes)* are very ſmall; they have alſo at the ſuperior end articular facets, which receive the heads of the phalangines, and are terminated by a tubercle which ſupports the nail.

The metacarpal articulation of the thumb has always, towards its palmary face, two ſmall round bones called *oſſa ſeſamoidea*. Others are ſometimes found towards the articulations of the other phalanges. The articulation of each phalanx is ſecured by an articular capſule and lateral ligaments.

Independently of the movements which the hand is ſuſceptible of performing by following thoſe of the radius, it can alſo bend forwards, backwards, and towards the ſides. The bones of the carpus, as well as thoſe of the metacarpus, perform on each other only very light and gentle movements; but the aggregate of theſe movements produces a very ſtriking effect, and greatly contributes to give the hand pliability and mobility. The four fingers, being ſeparated and free, can perform ſeparate movements of flexion, in the articulation of the phalanges, and lateral movements on the bones of the metacarpus.

The two phalanges of the thumb, and the correſponding bone of the metacarpus, form a ſeparate finger, which is articulated directly on the carpus;

carpus; moves freely in every direction, and can be oppofed to the other fingers.

The thumb of man is freer, and proportionally larger, than that of apes; its metacarpal bones are alfo lefs concave than thofe of thefe animals; fo that man, with refpect to the bones of the hand, exhibits an arrangement more advantageous than any other animal.

47. The thoracic limbs are inferior in ftrength to the pelvian; they are alfo fhorter: their great mobility on the fhoulder and with the fhoulder; their eafy flexibility in the articulation of the cubitus, but in particular that variety and pliability of motion of which the fore-arm and the hand are fufceptible, form one of the great advantages which man enjoys over other animals.

Some relation feems to have been remarked between the increafe of the thoracic limbs and the expanfion of the bones of the cranium. It has been obferved that children, in whom the bones of the cranium do not affume their ufual development, becaufe the brain is in part wanting *(acephali)*, have their arms exceedingly long, while thofe in whom the bones of the cranium, in confequence of water collected in the infide of it, affume a great expanfion, *(hydrocephali,)* have the arms very fhort.

It may be remarked alfo that, of all the *mamma-*

lia,

ka, man has the largeſt head and the ſhorteſt limbs. This ſtructure would be very unfavourable for walking on all four.

Of the Pelvian Limbs.

48. Pelvian limbs of animals. All animals which have thoracic limbs are furniſhed alſo with pelvian limbs: we muſt however except cetaceous animals, in which theſe parts are wanting.

The pelvian limbs, in general, have a ſtructure analogous to that of the thoracic limbs: thus a bone has a cavity proper for receiving the bone of the thigh, as the ſcapula receives the humerus: the thigh is formed of only one bone, in the ſame manner as the arm; the leg like the fore-arm conſiſts of two bones; and the foot, in the ſame manner as the hand, is formed of three analogous bones. Notwithſtanding this great ſimilarity between the thoracic and the pelvian limbs, each of their parts exhibits differences ſo ſtriking, that it is hardly poſſible to confound them; and therefore it is of importance that they ſhould be examined ſeparately.

49. The hip. The upper part of the pelvian limb is formed of a broad bone placed at the bottom, and on the ſide of the vertebral column: it is called the coxal bone, and forms the hip.

The hip bones are directed in the portion of

a curve

a curve towards the belly, and unite at a certain diſtance from the vertebral column.

The excavation formed by the two coxal bones, and that part of the vertebral column to which they are attached, has bee ndiſtinguiſhed by the appellation ot *pelvis*.

The hip bones are generally articulated without motion on the vertebral column: in tortoiſes, however, they are moveable. In birds the lumbar vertebræ, the os ſacrum, and the coxal bones form only one.

Animals with pouches, ſuch as the *didelphis*, have before the pelvis *(pubis)*, two articulated and moveable bones, called the *marſupial bones:* to theſe bones are attached particular muſcles, which ſupport a bag or pouch containing the teats.

The coxal bones vary much in their form in different animals; which gives to the pelvis various configurations, and produces ſtriking changes in the mode in which the thigh is articulated on theſe bones.

50. THE HIP IN MAN. The hip bone in man, which is very irregular, forms chiefly the haunch: it is broad behind, and at the top; but becomes narrower, excavated, and indented at the bottom and before.

At an early age this bone conſiſts of three parts, which have been diſtinguiſhed by names according to their poſition. The broad portion,

which is behind and on the fides, is called the *ilium*; that part below the firft is named the *ifchium*; and that entirely before is the *pubis*.

The *iliac* portion of the coxal bone exhibits behind and within a large articular furface, with which this bone is united to the *facrum*; it then advances by a large plane portion which juts out at the top and on the fides; the upper edge of this bone is broad and rounded; it defcends behind, and at the end has a large tuberofity: before, this edge terminates in a right angle, at the bottom of which is a tuberofity.

The *ifchial* portion is below and before the ilial; in the middle and on the exterior fide it has a deep cavity called the *cotyloid*, which receives the head of the thigh-bone; this cavity, which turns outwards, downwards and a little forwards, is not completely formed by this part of the hip bone: the other two contribute alfo to its formation. At the bottom of this cavity is a fmall foffa, and on its interior edge a deep indentation.

The ifchial portion has behind two *notches* feparated by a tubercle; it is terminated below by a large *tuberofity*, on which the human figure refts when it fits; in the infide and before it has a notch, which being united to another belonging to the pubis forms the *fub-pubian* hole, which in the male is oval, and in the female triangular.

The *pubic* portion of the hip bone is entirely

before; it is terminated by a narrow edge furnifhed with a cartilage, by means of which this bone is applied to the cartilage of the correfponding part.

This articulation is called the *fymphyfis* of the *pubis*. Above their junction, thefe portions of bone have a prominence, and below an *arch* (of the *pubis*).

The fpace circumfcribed by the broad hollow part of the ilium conftitutes the *large pelvis*; the other formed below by the ifchium, the pubis, the os facrum, and the coccyx, and which is narrower, conftitutes the *leffer pelvis*: the name of *upper ftrait* has been given to the fomewhat narrow edge which feparates thefe two cavities, and that of *lower ftrait* to the fpace comprehended between the tuberofities of the ifchium, the arch of the pubis and the coccyx.

Thefe cavities behind have notches filled up in part by exceedingly ftrong ligaments, which ferve to fix thefe bones to the os facrum, and to the laft of the lumbar vertebræ: they are called the *ileo-lumbar*, the *large* and *fmall facro-fciatic* ligaments, and the *facro-iliac* ligaments.

The articular portions of the hip bones, which form the fymphyfis of the pubis, are covered before with a cartilage of greater or lefs thicknefs.

They are kept together before by a bunch of ligamentous fibres, and below by a triangular ligament.

In

In conſequence of the vertical poſition of man, the pelvian cavity is turned upwards; and it can receive and ſupport a part of his abdominal viſcera: this advantageous diſpoſition cannot take place in animals, and particularly quadrupeds, the aperture of whoſe pelvis is turned directly forwards; but the region of the pubis, which in theſe is very narrow and forwards, is lower, and often very broad in man, and ſupports a part of the viſcera.

51. THE THIGH. The thigh always conſiſts of one bone, named the *femur*; which, in general, has nearly the ſame ſhape, but varies a great deal in its proportion. In ruminating animals and the ſolipeda it is ſo ſhort, that the limb which it forms, being in part concealed by the fleſh, is not commonly taken for the thigh: this bone is ſtill ſhorter in the phocæ.

52. *Femur*. In man, the thigh, the length of which determines that of the limb, is nearly cylindrical: it has, however, behind a rough *line* called the *femoral*, which indicates the place where the muſcles are attached, and is continued along two thirds of the bone at the upper part.

This bone has at its ſummit an articular head, which is turned inwards, and a little upwards, and which is ſupported by a *neck*: this head has a ſmall depreſſion in the middle. The femur, directly above, is terminated by a large tuberoſity,

 which

which projects a little outwards, and which is distinguifhed by the name of *trochanter*. On its interior fide behind it has a *cavity*. Behind thefe parts, but lower down, and a little within, is another fmaller tuberofity, called the *trochantin*.

The femur is terminated below by two large articular facets, rounded from the fore part backwards in the form of the portion of a wheel, and called *condyles*: of thefe condyles the exterior is fmaller, and does not defcend fo low as the interior: they are feparated by a groove, which terminates behind at a depreffion called the *foffa poplitea*: from behind the condyles proceed two lines, which afcend obliquely, and unite at the femoral line: before thefe condyles the rotula is placed.

The femur is articulated by its *head* with the *cotyloid cavity* of the hip bone, and can perform on it motions in every direction. Thefe bones are retained in their pofition by a ftrong articular capfule, and an inter-articular (*round*) ligament.

53. LEG. The leg fometimes is formed of only one bone, called the *tibia*, as in ruminating animals. In others, fuch as the dog, rat, fwine, and birds, it is compofed of the tibia and another bone or portion of a bone, which coalefces with it for a greater or lefs extent. In a great many of the mammalia the leg is formed of two diftinct and feparate bones, viz. the *tibia*, and another

much

much ſlenderer called the *perone* or *fibula*: theſe two bones are articulated below with thoſe of the foot; above, the tibia only is joined to the bone of the thigh, and the perone remains united on the ſide of the tibia. In the laſt place, in the greater part of oviparous quadrupeds, the two bones of the leg are articulated at the top with the bone of the thigh, and below with thoſe of the foot.

Before the articulation of the thigh with the leg there is generally a ſmall flat bone called the *rotula*.

In man, the thigh is formed of the *tibia* and a diſtinct *perone,* which is articulated above only with the tibia: the knee is furniſhed alſo with a rotula.

54. *Tibia.* The tibia, throughout almoſt its whole length, affects a triangular form: the anterior edge *(prætibial)* is very ſalient; it is terminated at the top by a tubercle, to which a ſtrong ligament is attached. This portion of the tibia becomes much larger in that part, and is diſtinguiſhed by the name of the head: below this head is a plane ſurface, on which there are two articular faces, ſlightly excavated, which receive the condyles of the femur, and are ſeparated from before backwards by a double elongated tubercle. The ſides of the head of the tibia are diſtinguiſhed by the name of *condyles.* A little behind the head of the tibia, under the exterior condyle, is a ſmall articular facet, which receives the *perone.*

 The

The tibia is ſmaller below, and terminates in a concave articular ſurface of greater extent in a croſs direction, and which reſts on a bone of the foot. On the interior ſide of this ſurface is a large tuberoſity, prolonged below, and which forms the interior malleolus: its exterior ſide, ſlightly notched, has an articular facet, which receives the perone. The poſterior face of the tibia is diſtinguiſhed by the name of the poplitean.

55. *Perone.* The perone, which is very ſlender, is ſituated at the exterior ſide of the tibia, and a little behind it. At the upper extremity it has a head, on the ſide of which is an articular facet reſting againſt that bone. At the lower end the perone deſcends below the tibia: it makes a projection outwards, which forms the exterior malleolus, and on the inſide has an articular facet for its junction with the tibia, and the bone of the foot which receives it.

56. *Rotula.* The rotula is a ſmall flat round bone, having behind it a double facet, which correſponds before the femur.

The articulation of the knee is ſecured by an *articular capſule* and two *lateral* ligaments; before by a ſtrong ligament, which belongs to the rotula, and behind by two *croſs* ligaments: this articulation has alſo two inter-articular cartilages of a *ſemilunar* form.

The

The perone is fixed to the tibia by an articular capſule, and an anterior and poſterior ligament.

The ſpace left between the two bones of the leg, which is larger above, is filled by a ligament attached on the edges of theſe bones.

The leg can perform only very extenſive movements of flexion backwards.

57. LAST PART OF THE PELVIAN LIMB. The laſt part of the pelvian limb, like that of the thoracic limb, has received different names according to its mode of termination; but it is always formed of a *tarſus*, a *metatarſus*, and *toes*.

The bones of the tarſus vary very much both with reſpect to their form and number. The tarſus in birds conſiſts of only one bone; in the three-toed ſloth it conſiſts of three; in ruminating animals, of from five to ſix, and very often of ſeven. The bones of the tarſus are in general thick and ſhort: in ſome animals, however, they are very long.

The bones of the leg are articulated, in general, with only one bone of the tarſus; but in reptiles they reſt on two bones of that part *.

The bones of the metatarſus, in animals, have the ſame general arrangement as thoſe of the metacarpus; and the toes, which are articulated to one or the other of theſe parts, exhibit alſo the ſame mode of termination.

* The tibia reſts on the aſtragalus, and the perone on the calcaneum.

The pelvian limb has only five toes * ; each toe consists at most of four phalanges †, and the large toe has only two ‡. The solipeda have only one toe on the hind-foot, and one finger to the fore-foot. Ruminating animals have two on each foot, articulated on their cannon bone. Some animals, such as the tapir and the rhinoceros, have three toes, and the swine has four. The greater part have five. The frog has six. The toes are often parallel, as in carnivorous animals: in the quadrumana and pedimana the great toe is a *thumb*, which can be opposed to the other toes. In birds which have three toes they are parallel: those furnished with four have one or two turned backwards, or all the four turned forwards. The number of the phalanges in these animals is increased by one for each toe, proceeding from the great toe. The large toe is shorter than the rest in the quadrumana and pedimana, all the toes of which are very long: in some of the carnivorous animals it is nearly equal to the rest: in man it is the largest of all the toes.

58. FOOT OF MAN. The foot of man is formed of the tarsus, the metatarsus, and the toes.

Tarsus. The tarsus of man consists of seven bones. That on which the two bones of the leg

* The frog has six.

† In the toe before the last of the lizard there are five.

‡ In that of the chameleon there are three.

are

are articulated is called the *aſtragalus*; it is placed on another larger bone which forms the heel, and which is called the *calcaneum:* a third, ſituated before the *aſtragalus*, is diſtinguiſhed by the name of the ſcaphoid bone *(os ſcaphoides)* or navicular bone *(os naviculare)*. The other four, placed in a row, receive the bones of the metatarſus: the firſt three, counting from the great toe, are known by the name of the *cuneiform* bones, and the fourth by that of the cuboid.

59. *Aſtragalus.* The aſtragalus has at the top an articular facet, rounded from before backwards, in the form of the portion of a pulley; it is received by the articular cavity of the tibia. On the ſides of this facet, the aſtragalus receives without, the extremity of the perone, which forms the exterior malleolus, and within the tuberoſity of the tibia, which produces the interior malleolus. The aſtragalus has alſo articular facets for its union below with the calcaneum, and before with the ſcaphoid and even the cuboid bones.

60. *Calcaneum.* The calcaneum, which is larger than the preceding bone, is lengthened from the fore part backwards; and has above and before a deep indentation or notch which receives the aſtragalus, and directly before another facet for its junction with the cuboid bone. This bone is lengthened behind by a large tuberoſity, which forms

forms the projection of the heel, and below it there are two tubercles.

61. *Scaphoid bone.* The ſcaphoid bone is articulated behind with the aſtragalus; on the outſide with the cuboid bone, and before with the three cuneiform bones.

62. *Cuboid bone.* The cuboid is united behind to the calcaneum and the aſtragalus; in the inſide to the ſcaphoid bone and the third cuneiform bone; before it is articulated with the two laſt bones of the metatarſus.

63. *Cuneiform bones.* The three cuneiform bones are articulated behind with the ſcaphoid bone; on the outſide with the cuboid, and before with the four firſt of the metatarſus; ſo that the firſt cuneiform bone touches the two firſt bones of the metatarſus; the ſecond touches only the ſecond; the third touches the ſecond, the third, and the fourth. Theſe bones are articulated with each other on the ſides. It is to be obſerved that the three cuneiform bones have really the form of a *wedge*; that their diſpoſition with the other bones of the tarſus is ſuch, that this part forms a moveable arch marked by the inſtep, and that, in progreſſion, all the bones of the tarſus do not reſt on the ground.

64. The articulation of the leg with the foot is ſecured by a *capſule*, an *interior lateral ligament*, and three *exterior lateral ligaments*.

The

The five bones of the metatarſus, which are nearly of the ſame length, have behind articular facets for their union with the *cuboid* and the three cuneiform bones; and before ſmall heads, which are received by the excavated facets of the firſt phalanges: theſe bones are articulated alſo with each other on the ſides by their poſterior extremity.

The articulation of the bones of the tarſus with thoſe of the metatarſus, and that of all theſe bones with each other, is ſecured by ligaments analogous to thoſe which fix the bones of the carpus and metacarpus; except the firſt bone of the metatarſus, which is not ſeparated like the firſt of the metacarpus.

The phalanges of the toes have the ſame mode of articulation and the ſame means of junction as thoſe of the fingers, and are equal to them in number.

The five toes are parallel; and the large toe is longer than the reſt, which go on decreaſing in ſize to the laſt.

65. The ſtructure and arrangement of the bones of the foot are ſuch, that they conſtitute an arch more elevated and more extenſive in the inſide than without: the foot reſts behind on the extremity of the calcaneum, which is directed a little outwards; it reſts before on the anterior extremity of the bones of the metatarſus, and on the toes; and in the middle of its exterior edge the foot reſts

on

on the poſterior head of the laſt bone of the metatarſus. It is to be remarked, that the aſtragalus forms in the inſide the ſummit of the arch, and that the leg, ſupported by this bone, correſponds with this arch in the place where the bones by which it is formed do not touch the ground.

66. Beſides the bones already mentioned, there are always two ſmall round bones below the metatarſian articulation of the large toe: there are ſmall bones alſo ſometimes at the articulations of the phalanges: theſe bones are called the *ſeſamoid (oſſa ſeſamoidea).*

67. The bones of the limbs have alſo ſome peculiarities common to the bones of the trunk and the head: thus, for example, they are all covered with a perioſteum; frequent aſperities, which mark the places where the muſcles adhered, are alſo obſerved in them, and they have holes by which they are pierced throughout their whole thickneſs. The long bones have alſo in the inſide a cavity, larger in the middle, which goes on increaſing to the extremities, where it terminates in oſſeous fibres that croſs each other in different directions, and form a kind of *net-work.*

The cavities of the long bones are lined alſo with an interior perioſteum.

68. The ſkeleton, examined in general, exhibits

hibits an aſſemblage of pieces equally pliable and ſtrong.

The vertebral column conſiſts of 24 very ſhort bones, light, exceedingly ſtrong, articulated in ſeveral points, and their articular ſurfaces are covered with a thick cartilage highly elaſtic, and ſuſceptible of yielding to every purpoſe. All theſe bones are retained in their poſition by ligaments ſufficiently ſtrong and numerous to give that column the requiſite degree of ſtrength. The aggregate of the vertebræ affects different curves, which can be increaſed or diminiſhed according to circumſtances.

The head reſts on the vertebral column almoſt by its centre; and the two firſt vertebræ have a peculiar diſpoſition, which allows the greateſt movements.

The diſpoſition of the bones of the cranium, in the form of an arch, is exceedingly well calculated to ſecure the brain from the action of all external bodies; and the vertebral canal protects the prolongation of the brain which it receives.

The vertebral column ſerves alſo to ſupport the ribs, the aggregate of which, together with the ſternum, forms a conical cavity ſtrong and exceedingly flexible, which envelops the heart and the lungs.

The vertebral column reſts on the os ſacrum: this bone with the two hip bones forms a cavity, the

the different pieces of which, united ſtrongly by cartilages * and ligaments, are however ſuſceptible, when neceſſary, of very ſtriking movements.

The cotyloid cavity is ſituated in an oblique direction on the exterior ſide of the hip bones: the femur is bent forwards; its head and neck have an oblique direction, and its interior condyle is longer: the knee is ſlightly inclined inwards, and the thigh is always ready to bend upon the leg: the tibia is ſomewhat curved, and the foot inclines outwards, and forms an arch.

This general conſtruction, which every where exhibits curves, angles, and folding levers, unites agility to ſtrength, and ſeems to be well adapted for performing, without any ſhock, thoſe movements communicated to the trunk by ſtamping the feet againſt the ground.

69. When a man walks faſt, ſtamps with his foot, or falls in an upright poſture, there is produced, in this action, a quantity of motion which muſt neceſſarily be employed, and produce an effect; and if by habit this effect occaſions no diſorder, the motion muſt be diſtributed by a peculiar diſpoſition to every part, without producing any ſhock.

When the foot indeed ſtrikes the ground, the

* Theſe cartilages ſwell up during the laſt months of pregnancy; which gives more amplitude to the pelvis, and diſpoſes the bones of which it is formed to move with greater facility.

motion produced is communicated to the places which begin to bear: thus the heel, the anterior extremity of the bones of the metatarſus, and the exterior edge of the foot, receive the firſt impreſſion. The arch formed by the foot on the interior ſide gradually ſinks down; the inter-articular cartilages yield, and the motion then propagated along the tibia immediately increaſes its curvature.

The motion, when it reaches the knee, is not communicated in a ſtraight line to the thigh: it divides itſelf on the ſides, paſſes from the condyles of the tibia to thoſe of the femur, and the ſemilunar cartilages, interpoſed between theſe parts, immediately yield: on the other hand, the direction of the knee inwards and ſomewhat forwards diſpoſes it to give way, and it then bends.

The motion being then continued along the femur immediately increaſes its curvature, and when it reaches its neck forces it to bend. The head of the femur does not bear directly under the pelvis, but reſts obliquely in the cotyloid cavity; ſo that it acts upwards and backwards on the edge of that cavity, compreſſing the articular cartilages; and at that moment the pelvis bends on the thigh as the thigh bent on the leg.

It is to be obſerved, that, in this action of the parts, the articular capſules, the ligaments and the muſcles,

muſcles, which ſurround the articulations, eaſily give way, and recover their former ſtate.

The motion communicated to the bottom of the cotyloid cavities tends to carry the hip bones upwards and inwards. To obey this impreſſion, the curvature of theſe bones decreaſes momentaneouſly; they move before in the articulation of the ſymphyſis, and behind they glide on the ſacrum. This bone, ſhaped like a wedge, penetrates between the hip bones, tends to ſeparate them, and oppoſes the firſt impulſe that tended to bring them together: in this action the inter-articular cartilages and the ligaments yield more or leſs.

In the laſt place, if any motion remains, it is communicated obliquely to the vertebral column by the top of the ſacrum, and continuing along that part it increaſes its different curvatures; depreſſes its inter-articular cartilages; and cauſes the vertebræ to glide on their different ſurfaces. The motion, when it reaches the cervical region, communicates itſelf to the head, which is there ſuſpended, and as it were in equilibrium; and as it has a tendency to fall forwards it bends on the neck.

From this arrangement, it may be ſeen that the ſum of the motion communicated to the feet muſt be very great before there can reach the vertebral

column

column and the head a quantity capable of producing derangement in the parts it contains; which indeed happens very rarely.

70. *Female ſkeleton.* The female ſkeleton is in general ſhorter than the male; but the trunk is comparatively lengthened, ſo that the half of the body, which in man correſponds to the pubis, is above that part in the female. The bones which compoſe the female ſkeleton are ſlenderer, weaker, ſmoother, rounder and whiter: the eminences, aſperities, cavities, and holes, are neither ſo ſtrong nor ſo ſtriking.

The female ſkeleton, compared to that of the male, exhibits alſo very apparent local differences.

The vertebral column is comparatively longer, and the capacity of the breaſt ſhorter; ſo that the lumbar region is the moſt extenſive. The greater elongation of the trunk ſeems to be connected with a greater thickneſs of the bodies of the lumbar vertebræ, and particularly of their inter-articular cartilages.

The alternate curvatures of the vertebral column ſeem a little leſs ſtriking in the female; but the whole trunk affects a ſort of obliquity; the ſacral region is thrown backwards; the breaſt is carried more forwards, and the head requires to be kept more erect. This diſpoſition, which is owing to the greater capacity of the pelvis, and the more

 forward

forward poſition of the cotyloid cavities, is ſtill increaſed in the ſtate of pregnancy, when the projection of the abdomen forces the breaſt and head to be thrown backwards, in order that the equilibrium may be preſerved.

The tranſverſe apophyſes of the dorſal vertebræ are thrown more backwards; the poſterior arch of the ribs is more convex, and the vertebral grooves are more excavated.

The ribs are ſlenderer as well as ſmoother; their convexity behind is much greater, and the cartilages of the falſe ribs are more elongated.

Of the two pieces which compoſe the ſternum, the ſuperior is generally thicker and longer. The inferior is much ſhorter in the female, but in ſuch a proportion that the whole ſternum is ſhorter: the point of it is thrown a little forwards, while in man it is turned directly downwards.

In conſequence of the peculiar ſtructure of the dorſal vertebræ, of the ribs and the ſternum, the thorax, in the female, has leſs tranſverſe breadth; is leſs flattened before, and is more convex behind; it is alſo wider below, and more rounded in its circumference.

The clavicle, in the female, is longer, and almoſt ſtraight, ſo that the ſhoulders are thrown more backwards, and project leſs on the ſides of the thorax. To this peculiar diſpoſition of the ſcapula,

ſcapula, thrown farther back, is aſcribed the difficulty which women experience in performing great movements with the arms, and in projecting bodies, which they cannot do with the ſame force and eaſe as men.

The head, in the female, is ſmoother and more rounded; and the face is ſhorter.

The pelvis, in general, is broader and ſhallower in the female; the iliac portions of the hip bones are thrown more back; the pubis is tranſverſely broader, and has leſs height: the pubian arch is wider, and the ſub-pubian hole is triangular. The aperture of the pelvis is turned more upwards; the diſtance of the tuberoſities of the iſchium is greater, and the curvature of the os ſacrum is more apparent.

The cotyloid cavities are more forward, leſs oblique, and of leſs depth.

The neck of the femur has a more horizontal direction; the interior condyle of that bone is larger, more convex, and deſcends lower.

It follows from the peculiar conformation of the pelvis, and that of the femur in women, that the haunches are broader; that the ſacral region projects more poſteriorly; which determines the inclination of the trunk, and the projection forwards of the thorax. The cotyloid cavities are at a greater diſtance, and the knees are larger, and ap-

proach each other more; which forces the feet to turn outwards.

This peculiar difpofition determines the grand lateral movements of the pelvis, which women perform in walking to tranfport alternately the weight of the body to the two femora, and thus preferve the centre of gravity.

Dupuytren has obferved, that till the age of puberty the female pelvis differs very little from that of the male; that both have the fame triangular form, and the antero-pofterior diameters nearly equal: but at that period the female pelvis acquires a rapid expanfion; it becomes oval; its tranfverfe diameter has lefs extent, and it foon affumes all its diftinguifhing characters.

The general difpofition of the breaft and pelvis, in the male and female, is fuch, that if two parallel lines be continued upwards and downwards, from the fides of the thorax, it is obferved in the male that a part of the fhoulders is cut by thefe lines; while in the female thefe lines interfect a part of the bones of the pelvis. The breaft in the male is in fome meafure fquare; in the female it is conical.

71. During the firft days of conception, the germ is a gelatino-albuminous fluid, in the middle of which fibres or filaments gradually appear.

This

This ſtate continues till the 20th day, at which period there is developed in different points of the embryo a concrete, white, elaſtic ſubſtance, called cartilage; and towards the 30th or 40th day the fœtus begins to exhibit in various parts of the cartilages ſome ſpecks of more conſiſtence, which are the firſt development of the bones.

It is remarked that one cartilage only is formed for the whole of the bones that are to remain united; ſuch as the cranium, the vertebral column, and the pelvis; and that a particular one is formed for each of the bones which are to remain ſeparate and moveable. The part which at that period forms the cavity of the cranium is a ſort of membrane.

The bones continue to expand during the time of geſtation: the firſt points of oſſification appear in the bones of the ſhoulder and thoſe of the cranium; they next appear in the ribs, the bones of the arm and fore-arm; then in the vertebræ and the pelvis: in the laſt place, they are ſeen in the bones of the thigh and leg, in thoſe of the metacarpus, the metatarſus, the fingers and the toes.

The bones of the carpus, thoſe of the tarſus, the calcaneum excepted, and the rotula, remain cartilaginous till after birth.

The long bones expand by three points of oſſification; one for the centre, and two for the extremities; the large flat bones have their point of

offification in the centre. This point furnifhes longitudinal or radiated fibres, which advance, meet, and crofs each other to form one folid piece.

At the period of birth the fkeleton of the fœtus exhibits very remarkable peculiarities; the whole of it is ftill, in a great meafure, cartilaginous.

The vertebral column is quite ftraight, and its apophyfes fcarcely appear.

The breaft is very fmall, and the head is comparatively very large.

The bones of the face are not much expanded, and the face itfelf is exceedingly fhort; for the want of teeth exhibits a facial angle very large. The finuses of the head, as well as its different prominences, are fcarcely marked; while the cavities of the eyes, and particularly the auditory canals, feem at that period to have acquired their full expanfion.

The thoracic limbs are comparatively very long. The pelvis is very fmall, and its axis is almoft directed ftraight upwards.

The thighs and the legs are alfo very flender and fhort; fo that in the fœtus, at that period, the half of the body correfponds nearly to the navel.

The bones, which are flexible and flender in infancy, increafe by degrees, and their complete expanfion makes the fkeleton affume the form which it is obferved to have in adults. When the body has

has attained to its full growth, the bones are firmer as well as more elaſtic, and aſſume a grayiſh colour; but with age they become dried and more brittle, and their colour is a dirty yellow.

72. In old age all the prominences, cavities, aſperities and holes are more apparent; the curvatures of the bones are greater; the articulations are leſs moveable in conſequence of the oſſification of a part of the cartilages, ligaments, tendons, capſules, &c. by which the articulations are ſurrounded.

The face becomes ſhortened by the loſs of the teeth; the chin ſtands more forward, and the alveolar edges become ſharper.

73. The various parts of the bones exhibit ſtriking differences in regard to their denſity; ſome are formed of a cloſer and more *compact* tiſſue, and have a white and ſmooth appearance; others exhibit a cellular, polyedral tiſſue, lax, and as it were ſpongy; they are lighter, and not ſo white; ſome of theſe bones exhibit only a few fibres, which croſs each other, and form an open or *reticular* tiſſue: in a word, they compoſe ſolid bodies more or leſs elaſtic, which ſeem to conſiſt of laminæ laid above each other.

74. If a bone be placed in an acid, ſuch as the muriatic, diluted with water, it becomes ſoft, and

loses about the half of its weight. Carbonic acid gas is disengaged from the liquor, and there is deposited at the bottom a sediment, the weight of which is equal to that lost by the bone: this deposit is muriate and phosphate of lime: what remains of the bone exhibits a fibrous, vascular and gelatinous character.

If a bone be placed in a solution of caustic alkali (potash or soda), it loses half its weight in the same manner; it remains solid, but becomes brittle and friable: the residuum is found to be a sort of soap, and the earthy part is phosphate and carbonate of lime.

In the last place, if a bone be calcined in an open fire, it still loses half its weight, and what remains is phosphate and carbonate of lime.

If it be required to ascertain, by a more accurate analysis, the quantity of solid matters which enter into the composition of bones, the following method may be employed: calcine the bones till they are white, and, having pulverized them, subject them to the action of the nitric acid. This acid will dissolve the lime and the phosphate of lime: then pour ammonia into the solution, and the phosphate of lime will be precipitated: separate this salt by filtration, and weigh it after it has been thoroughly dried. The filtrated liquor still contains lime, which must be precipitated by common potash: this lime is united to carbonic

acid; but it may be freed from it by calcination, and it will then be obtained pure.

It refults from thefe experiments, made upon bones, that 100 parts are compofed of: 50 foft organic parts; 40 phofphate of lime; and 10 carbonate of lime.

75. The real organic and living part of bone is compofed of its *vafcular tiffue*. We muft therefore conceive that a very great number of veffels proceed to and from the membrane which envelops the bone, and that thefe veffels are indefinitely ramified, and crofs each other in every direction, throughout the thicknefs of the bone.

After the firft months of geftation thefe veffels depofit, in the cells left between their croffings, a cartilaginous juice, which at the end of fome time difappears, and its place is fupplied by the faline matter which gives folidity to the bones.

The cavities of the long bones are lined by a membrane, which has a communication with all the veffels of the bone; and this membrane gives birth internally to a great number of other veffels that crofs each other, and in the interftices between which a fat and albuminous matter is depofited: this laft part forms the marrow.

It is to be obferved, that the membranes with which the bones are covered, externally and internally, are only a more compact tiffue of veffels.

MUSCULAR SYSTEM.

76. Our organs are moved by means of mufcles. The greater part of the carneous mafs, the meagre and fibrous portion of the flefh of animals, conftitutes the mufcles. They are compofed of fibres in bundles.

The fibres of the mufcles are fubdivided in an indefinite manner. Each fibre, and each bundle of fibres, is enveloped by a cellular membrane, which is a tiffue of veffels. Each mufcle alfo is furrounded by a cellular membrane of greater thicknefs.

The mufcles are continued, and generally terminate in a fmooth, white, fhining fubftance, of a very compact fibrous texture, round or flat, and always of lefs fize than the body of the mufcle. That portion of a mufcle which terminates in a cord is called a *tendon*; and that which fpreads itfelf into a broad flat furface is diftinguifhed by the name of *aponeurofis*. It is generally by thefe tendinous or aponeurotic parts that the mufcles are fixed to the bones.

The gelatinous, albuminous, and fat fubftance, contained in the *cells* of this *tiffue*, produces fullnefs of the mufcles.

The cellular tiffue, interpofed between the fibres of

of the mufcles, varies both in regard to its nature and quantity in different animals, in their different parts, and according to the different circumftances of health or difeafe.

In the mammalia the mufcles are of a darker or lighter red colour; in the gallinaceous they are paler, and in reptiles and fifhes almoft white.

The mufcular fibres have the property of contracting, of becoming fhorter, of carrying with them the moveable points to which they are fixed, and of producing, in this manner, various movements.

The mufcles of reptiles and of fifhes, which have white fibres, contract with much greater force and velocity than thofe with red fibres of other animals.

Mufcles are never found but in parts which perform very ftriking movements; and they are ftronger and of greater length, according as thefe movements are greater and more energetic.

The movements performed by our different parts are always a refult of the form of the bones, of the peculiar difpofition of their articular furfaces, of the different points by which the mufcles are affixed to thefe bones, and of the direction of the mufcular fibres. Confequently a knowledge of the ratio of the articular furfaces of the bones of any part, and of the nature of the motions which it performs, may always ferve to determine, in a general

general manner, the ſize, form, and direction of the muſcles of that part. But as the muſcles do not always produce their action in a ſtraight line; as they often act by points of reflection; to have a ſufficiently correct idea of them, it is neceſſary to know minutely their peculiar diſpoſition in man.

77. In the different animals the poſition of the muſcles, which are fixed to the vertebral column, varies according to the motions which are performed by that part. Thus the muſcles are oppoſite to the ſpinal and præſpinal face of the vertebræ, when the vertebral column bends forwards or is thrown back, as in the mammalia, birds, and reptiles. In animals which perform only lateral movements with the ſpine, ſuch as fiſhes, theſe muſcles are ſituated on the ſides of the rachis or ſpine. In animals which make the vertebral column, or one of its parts, move in all directions, as is the caſe with the bodies of ſerpents, the neck and tail of many of the mammalia, muſcles are found on the four faces of that part. In thoſe parts of the vertebral column which perform no motion, muſcles are wanting: this is the caſe with the ſpinal face of fiſhes, the dorſal region of birds, and the præſpinal face of the dorſal and lumbar vertebræ of moſt animals.

78. Muscles in man. In man, the muſcles affixed

affixed to the vertebral column, in order to make it move, are placed chiefly on the ſpinal face.

79. *Muſcles which produce motion in the vertebral column.* A very thick muſcle, which extends from the os ſacrum to the atloid vertebra, runs along the ſpinal face of the rachis. This muſcle is ſingle inferiorly, and is fixed to the poſterior part of the os ſacrum, and the edges of the os ileum. When it reaches the lumbar region, it divides itſelf into three parts: the firſt is inſerted in the tranſverſe apophyſes of the lumbar vertebræ, at the angle of the ribs, and in the tranſverſe apophyſes of the laſt cervical vertebræ: THE DORSO-TRACHELIAN or *ſacro-lumbar* portion; the ſecond part adheres to the tranſverſe apophyſes of the lumbar and dorſal vertebræ, as well as to the inferior edge of the laſt eight ribs: THE COSTO-TRACHELIAN or *long dorſal part*; this portion comprehends another, which extends from the tranſverſe apophyſes of the laſt five vertebræ of the neck to the firſt four or five of the back: *acceſſory of the long dorſal* or *great tranſverſe muſcle of the neck*; the third portion is inſerted in the tranſverſe articular and ſpinal apophyſes of all the vertebræ: the LUMBO-CERVICAL PORTION or *tranſverſe ſpinal* *.

* The particular name of *axoido-atloidian* has been given to that which proceeds from the tranſverſe apophyſis of the axoid to the ſpinal apophyſis of the atloid.

This

This mufcle, in contracting, bends the vertebral column backwards, or keeps it in a ftate of rectitude: THE SACRO-SPINIAN *.

80. The fpaces comprehended between the fpinal apophyfes of the vertebræ of the neck are filled by mufcles which are fixed to thefe apophyfes. They keep the neck ftraight, and draw it backwards. INTERSPINIAN OF THE NECK, *fmall fpinal of the neck.*

81. In the cervical and lumbar regions, the mufcles are fixed from one tranfverfe apophyfis to the other. When thofe on one fide act by themfelves, they bend the vertebral column towards the fame fide; when they act fimultaneoufly they keep it in a ftate of rectitude. INTER-TRANSVERSIAN OF THE NECK AND LOINS.

82. A mufcle which proceeds before the bodies of the firft three dorfal vertebræ, along the cervical vertebræ, is inferted in the anterior tubercle of the

* In defcribing the mufcles we fhall retain the nomenclature of Chauffier. This methodical nomenclature of the mufcles is founded on the points to which they are attached. Thus the name of every mufcle is compofed in general of two words, which indicate thefe two points: the firft indicates the point which is the moft fixed, and the fecond that which is moft moveable; fo that the name is a fort of concife defcription. We fhall adopt alfo, for the names of the mufcles, the uniform termination in *ien*, which Dumeril has given to them. [The Englifh tranflator has changed thefe terminations into *ian*.]

the atlas: it bends the neck forwards. PRÆ-DORSO-ATLOIDIAN; *long muſcle of the neck.*

83. To the body of the laſt vertebra of the neck is fixed a thin muſcle which is frequently wanting. This muſcle deſcends in an oblique direction on the ſide of the lumbar vertebræ, paſſes before the ilium, and is inſerted by a flat tendon in the ilio-pubic eminence. It tends to bend the ſpine on the pelvis. PUBIO-PRÆLUMBIAN, *the ſmall pſoas.*

84. From above the upper and poſterior edge of the ilium riſes a muſcle, which is fixed to the tranſverſe apophyſes of the firſt four vertebræ of the loins, and to the laſt rib. It ſerves to bend the vertebral column on the pelvis. ILIO-TRANSVERSIAN, *ſquare of the loins.*

85. Two ſmall muſcles extend from the ſpine of the iſchium to the ſides of the coccyx: theſe muſcles tend to carry that ſmall bone backwards. ISCHIO-COCCYGIAN, *idem.*

86. *Muſcles which give motion to the breaſt.* The breaſt is moved by means of numerous muſcles fixed between the ribs, or which extend from the ribs to the vertebræ; from the ribs to the ſternum, and even from the ribs and the ſternum to the bones of the pelvis.

The muſcles which extend from the breaſt to the pelvis form in a great part the ſides of the lower belly.

In

In ſome claſſes of animals the breaſt and lower belly form only one cavity, as is the caſe in birds; but in the greater number, theſe two cavities are ſeparated by a broad, thin muſcle called the *diaphragm*.

In the different animals, all theſe muſcles experience variations analogous to the different configurations of the ſkeleton; they are in a great meaſure wanting in thoſe which have no breaſt properly called.

87. *In man*, the interval between the ribs is filled up by two layers of muſcular fibres, which adhere to the edges of the ribs, and are directed obliquely in a contrary direction. THE INTER-COSTIAN, *inter-coſtal*, *exterior* and *interior*.

88. To the tranſverſe apophyſes of the laſt five vertebræ of the neck is fixed a muſcle, which is inſerted in the middle poſterior part of the three firſt ribs, by as many digitations. THE TRACHELO-COSTIAN, *ſcalene*.

89. Twelve muſcles proceed from the tranſverſe apophyſes of the laſt vertebra of the neck, and from the firſt eleven of the back, to the angle of the ribs. TRANSVERSO-COSTIAN, *elevators of the ribs*.

90. A muſcle extends from the ſpinal apophyſes of the laſt two vertebræ of the neck, and the firſt two of the back, to the angle of the firſt five ribs (the firſt excepted). DORSO-COSTIAN, *ſmall indented poſterior, ſuperior*. All theſe muſcles tend, in an eſſential manner, to elevate the ribs.

91. To the ſpinal apophyſes of the laſt two vertebræ of the back, and the firſt three of the loins, is fixed a muſcle which extends to the laſt four ribs, and tends to depreſs them. LUMBO-COSTIAN, *ſmall indented poſterior inferior.*

92. A muſcle of a triangular form proceeds from the interior ſurface of the ſternum, and extends to the laſt five ſternal ribs: it contributes alſo to depreſs the ribs. STERNO-COSTIAN, *triangular of the ſternum.*

93. The thorax is ſeparated from the abdomen by a large *odd* muſcle, which forms its *diaphragm.*

This broad, thin muſcle, tendinous in the middle and fleſhy on the edges, is fixed to the lower part of the ſternum, the cartilaginous contour of the ribs, the tranſverſe apophyſes of the laſt vertebra of the back, the firſt of the loins; and to the lateral parts of the bodies of the firſt two or three lumbar vertebræ, by two fleſhy pillars. This muſcle, convex on the ſide towards the breaſt, is pierced with three holes: the one on the right affords a paſſage to a large vein *(vena cava)*; the other enters the pillars, and gives paſſage to a large artery (*the ventral aorta*), to the canal of the chyle and lymph, and to the *azygos* vein; the third receives the alimentary canal and a nerve (eighth pair). It retains the name of DIAPHRAGM. This muſcle, becoming flat, by its continued and ſucceſſive con-

 tractions,

tractions, increases the capacity of the thorax, and thus contributes to inspiration.

The muscles here described produce the movements performed by the thorax during respiration.

94. From the ilium and the pubis proceeds a large muscle which rises in an oblique direction, and is fixed to the last eight ribs by as many digitations. This muscle unites and is confounded with that of the opposite side by a very strong aponeurotic expansion, which forms longitudinally on the middle of the abdomen a line called the *median.* These muscles in contracting tend to lower the breast, and to diminish the capacity of the lower belly. ILIO-PUBIO-COSTIAN, *exterior oblique* or *large oblique.*

95. These muscles cover two others which proceed also from the ridges of the ilium to the cartilages of the asternal ribs; they are fixed behind to the spinal apophyses of the last two vertebræ of the loins, and to the os sacrum; they are united before by a double aponeurotic expansion along the median line, and have the same action as the preceding. ILIO-COSTIAN, *interior oblique* or *small oblique.*

96. Between the aponeurotic leaves of the two preceding muscles, there are two muscular bands which extend from above the pubis to the sternum; to its appendix, and to the cartilages of the last sternal ribs.

The aponeurotic leaves which receive these

muſcles adhere to them in ſome points, and produce on them three or four tranſverſal tendinous lines. They bend the breaſt on the pelvis. Pubio-sternian, *ſtraight of the lower belly.*

97. A muſcle, fixed by a long aponeurotic expanſion to the tranſverſe apophyſes of the firſt three lumbar vertebræ, proceeds, in a croſs direction, to the median line. It adheres alſo to the cartilaginous edge of the thorax, the ridge of the os ileum, the crural arch, and the pubis. Theſe muſcles compreſs the ſides of the abdomen. Lumbo-abdominian, *tranſverſe of the lower belly.*

98. From above the pubis riſe alſo two ſmall muſcles, which terminate in a point below the navel. Pubio-sub-umbilian, *pyramidal.*

99. *Muſcles which move the head.* The diſpoſition of the muſcles, which ſerve to move the head, varies according to the manner in which the head is articulated with the neck.

Theſe muſcles, in animals which have the neck long, ſuch as the moſt part of birds, or thoſe which have no thorax, as ſerpents, are fixed to a point in the neck: in the mammalia they are fixed to the neck, the breaſt, and the ſhoulders.

In quadrupeds, whoſe head being often very large is ſuſpended before the vertebral column,

 and

and has need of being continually ſupported, theſe muſcles muſt be very ſtrong *.

100. *In man*, the muſcles which move the head have their fixed points of adheſion in the neck, the breaſt, and ſhoulders: they are ſituated before, behind, and on the ſides.

The muſcles which have a lateral poſition move the head when they act ſingly; when they act ſimultaneouſly they direct it forwards or backwards, or keep it fixed: the latter are the moſt numerous.

101. To the ſummit of the ſternum and a part of the clavicle are fixed two portions of a muſcle, which unite, and aſcend obliquely outwards and backwards, in order to be inſerted by a broad flat tendon at the baſe of the maſtoid apophyſis. The action of one of theſe muſcles makes the head turn on one ſide: when they act together they bend it forwards. STERNO-MASTOIDIAN, *idem*.

102. A muſcle is fixed before to the tubercles of the tranſverſe apophyſes of the laſt five vertebræ of the neck, by the ſame number of ſmall bands, which unite in aſcending. This muſcle is joined to its fellow before the firſt vertebra, and

* The head of theſe animals is retained chiefly by a very broad and thick ligament, which is attached to the ſpinal apophyſes of the back and neck, and is fixed to the occiput; it is known by the name of the cervical ligament.

both

both are inserted before the large occipital foramen. They raise the head when inclined backwards, and bend it forwards. THE LARGE TRACHELO-SUB-OCCIPITIAN, *anterior large straight.*

103. Behind this muscle is another very small one, fixed before and to the side of the atloid, which ascends within and is inserted before the large occipital foramen. It has the same action as the preceding. SMALL TRACHELO-SUB-OCCIPITIAN, *anterior small straight.*

104. Another small muscle, fixed before the transverse apophyses of the atloid, is inserted near the mastoid apophysis. It acts like the preceding. ATLOIDO-MASTOIDIAN, *lateral small straight.*

105. A muscle is fixed behind along the spinal apophyses of the first five vertebræ of the back, the last vertebra of the neck, and to the cervical ligament; it then rises, becomes broader, and is inserted in the transverse apophyses of the last two vertebræ of the neck (*cervical portion*), and the mastoid apophyses (*mastoidian portion*); it carries the head backwards. CERVICO-MASTOIDIAN, *splenius of the head.*

106. To the first four vertebræ of the back and those of the neck, the first excepted, are fixed the same number of small tendinous bands, which unite in ascending. This muscle proceeds backwards, and is inserted by a flat tendon towards the middle of the occipital arch close to its neighbour,

 from

from which it is ſeparated only by the cervical ligament. It keeps up the head, and pulls it backwards. TRACHELO-OCCIPITIAN, *large complexus* and *digaſtric of the neck.*

107. To the tranſverſe apophyſes of the firſt vertebra of the back, and the laſt four of the neck, are fixed the ſame number of ſmall tendinous and fleſhy bands, which unite in aſcending. The muſcle which they form is inſerted by a flat tendon behind the maſtoid apophyſis. It has the ſame action as the preceding. TRACHELO-MASTOIDIAN, *ſmall complexus* or *lateral maſtoidian.*

108. To the tranſverſe apophyſis of the firſt vertebra of the neck, is fixed behind, by a thick tendon, a muſcle which becomes much broader, aſcends obliquely behind and on the ſide, and is inſerted in the lower part of the occipital arch near the maſtoid apophyſis. Theſe muſcles elevate the head. ATLOIDO-SUB-MASTOIDIAN, *ſuperior oblique* or *ſmall oblique.*

109. A muſcle, which grows broader as it riſes, and is inſerted on the ſides of the occipital arch, below the preceding muſcle, is fixed to the ſpinal apophyſis of the ſecond vertebra of the neck: it elevates the head. AXOIDO-OCCIPITIAN, *poſterior large ſtraight.*

110. In the ſpace comprehended between the preceding muſcles is a ſmaller one, which proceeds from the poſterior tubercle of the atloid, expands

as

as it riſes, and is inſerted on the ſides of the occipital arch, behind the preceding: it has the ſame action. ATLOIDO-OCCIPITIAN, *poſterior ſmall ſtraight.*

111. There are ſome muſcles alſo which proceed from the head to the ſcapula; but, as they act more powerfully on the ſhoulder, we ſhall introduce them in another place.

All the muſcles here deſcribed ſcarcely ever act ſingly, but always in concurrence with a greater or leſs number of others; and it is the indefinitely varied combination which may take place between all theſe portions of force, that gives riſe to the pliability and variety of motion of which the parts of our bodies are ſuſceptible.

112. *Muſcles which move the face.* In all animals the face is overſpread with muſcles which ſurround the eyes, the noſe, and the mouth; and theſe muſcles, covered by a fleſhy panicle, have no other action than that of enlarging, contracting, or ſhutting the apertures of theſe different organs.

But in man, theſe muſcles compoſe a moveable phyſiognomy, the features of which become the living expreſſion of the various ſenſations he experiences.

113. The head of man is covered in the middle by a thin aponeurotic muſcle, which is fixed along

the occipital arch, and, proceeding towards the forehead, extends to the eye brows and the convexity of the nofe. This mufcle corrugates the fkin of the forehead, and elevates the eye-brows. OCCIPITO-FRONTIAN, *epicranius* and *pyramidal of the nofe.*

114. Two fmall mufcles, inferted in the nafal projections of the os frontis, lofe themfelves in the fubftance of the eye-brow. They elevate and corrugate the eye-brows. FRONTO-SUPERCILIAN, *fuperciliar.*

115. A fmall mufcle iffues from the bottom of the arch of the orbit, and expands over the upper edge of the tarfal cartilage of the upper eye-lid. It raifes it when fhut. ORBITO-PALPEBRALIAN, *elevator of the upper eye-lid.*

116. The eyes are furrounded by a mufcle, the femi-elliptical fibres of which feem to iffue from the interior angle of the orbits where they adhere, in order to proceed to the exterior angle: by contracting they fhut the eye-lids. PALPEBRALIAN, *orbicular of the eye-lids.*

117. A fmall mufcle, fixed to the maxillary bone, proceeds in a tranfverfe direction on the cartilage of the nofe: it ferves to dilate the noftrils. SUPER-MAXILLO-NASIAN, *tranfverfe of the nofe.*

118. Below the alveoli of the upper incifive teeth is a fmall mufcle, fixed to the alæ of the nofe,

nofe, which it tends to deprefs. ALVEOLO-NASIAN, *myrtiform.*

119. From the zygomatic arch arife two mufcles, which defcend obliquely towards the angle of the lips: by contracting they carry the lips upwards and backwards.

The fmaller of thefe two mufcles is placed above the other. ZYGOMATIC-LABIAN, GREATER and LESS, *great* and *fmall zygomatic.*

120. Three fmall mufcles are fixed to different points of the fub-maxillary bone: the *largeft* arifes on that bone towards the interior angle of the eyes; proceeds to the upper lip, and leaves fome fibres on the fides of the nofe: the *middle* one is inferted on that bone, below the orbitar cavity, and expands equally over the upper lip: the *leffer* is fixed above the alveolar edge near the angular tooth, and proceeds to the angle of the lips. Thefe mufcles ferve to elevate different points of the upper lip, and even the noftrils. SUPER-MAXILLO-LABIAN, GREATER, MEAN, and LESS; 1ft, Elevator of the *ala nafi and of the upper lip*; 2d, *Incifive or proper elevator of the upper lip*; 3d, *Canine, or elevator of the angle of the lips.*

121. From the part of the maxillary bone which correfponds to the chin, arifes an *odd* mufcle of a fquare form, which proceeds through the fubftance of the lower lip. It depreffes that part. MENTO-LABIAN, *fquare of the chin.*

122. At

122. At the bottom of the lower jaw, and on the ſides, ariſes a muſcle, which expands as it aſcends, and proceeds to the angle of the lips. It depreſſes that part. MAXILLO-LABIAN, *triangular*, or *depreſſor of the angle of the lips*.

123. At each ſide of the mouth is a thick muſcle, which is fixed at the top and bottom to the alveolar ſides of the two jaws, and behind to the inter-maxillary ligament: all the fibres of this muſcle take a croſs direction, and expand towards the angle of the lips: by contracting, theſe muſcles ſwell out the cheeks. They were called *buccinators*, becauſe they are thoſe principally put in action when a trumpet is ſounded, BUCCO-LABIAN.

124. Around the lips is an *odd* muſcle, the ſemi-oval fibres of which croſs each other towards the angles; they concur to form the thickneſs of the lips: by contracting they leſſen the aperture of the mouth. LABIAN, *orbicular of the lips*, or *ſmall inciſive of the upper and lower lip*.

125. All theſe muſcles of the face are covered, and their intervals are filled up with a greaſy tiſſue, exceedingly fine, and of a nature altogether peculiar: the fibres of theſe muſcles croſs each other in many points; and this diſpoſition increaſes the relation of theſe parts, and gives them a great degree of mobility.

126. A broad thick muſcle occupies the whole temporal

temporal foſſa and a part of the zygomatic. This muſcle, which is covered within by a ſtrong aponeuroſis, is formed interiorly of two layers of fibres which unite below in a thick tendon: this tendon embraces the coronoid apophyſis of the maxillary bone, below the zygomatic arch. This muſcle tends ſtrongly to elevate the lower jaw. TEMPORO-MAXILLIAN; *crotaphite* or *temporal.*

127. At the bottom, and on the ſides of the cheek, is a thick muſcle, which is fixed below the zygomatic arch, to the os zygoma, and to that part of the ſuper-maxillary bone united to it. This muſcle deſcends along the branch of the maxillary bone, and is inſerted in the exterior and inferior ſide of the angle of the jaw. It has the ſame action as the preceding. ZYGOMATO-MAXILLIAN, *maſſeter.*

128. In the cavity of the pterygoid apophyſis of the ſphenoid is fixed a muſcle which deſcends outwardly, becomes thick, and is inſerted in the interior ſide of the angle of the maxillary bone. It elevates the jaw, and tends to draw it backwards. GREAT PTERYGO-MAXILLIAN, *great* or *interior pterygoidian.*

129. The pterygoid apophyſis receives alſo on its exterior ſide a ſmall muſcle, which proceeds horizontally before the condyle of the maxillary bone, to which it is fixed as well as to the articular capſule. This muſcle tends to draw the condyle of the

the jaw forwards. SMALL PTERYGO-MAXILLIAN, *ſmall* or *exterior pterygoidian.*

130. A muſcle extends from the maſtoid apophyſis to the middle of the interior face of the jaw; it deſcends by a fleſhy portion towards the angle of that bone, where it preſents a tendon, which continues with another fleſhy portion inſerted in the genian apophyſes.

This digaſtric muſcle tends to depreſs the jaw. MASTOIDO-GENIAN, *digaſtric.*

131. Beneath the ſkin, between the breaſt and the chin, is a thin muſcle which originates below by a few fibres under the clavicle, and the acromion: theſe fibres approach each other, and riſe nearly to the chin, where they croſs the fibres of the oppoſite muſcle: the action of this muſcle is not ſenſible.

This muſcle is much ſtronger and more extended in animals; it ſpreads itſelf over the face, and forms the carneous panicle, which, as already ſaid, covers the muſcles of that part. It ſtrongly corrugates the ſkin of the neck. THORACO-FACIAN, *cutaneus.*

132. MUSCLES OF THE LIMBS. The limbs of animals have different uſes, and perform various motions; the reſult not only of the configuration of the bones which form them, but of the peculiar diſpoſition alſo of the muſcles fixed to them.

Thus, in apes, it is not the peculiar ſtructure of

of their bones that prevents them from ſtanding perfectly erect, with the leg extended, and the ſole of the foot entirely reſting on the ground, but the peculiar diſpoſition of the muſcles, which keep the thighs half bent on the pelvis, and the heel raiſed up. The caſe is the ſame with other animals; they all perform movements, which are the reſult of the peculiar ſtructure of the bones and muſcles of which their limbs are formed.

The thoracic limbs of birds, covered with feathers, form wings proper for flying; their pelvian limbs ſerve them for walking; and in ſome they are furniſhed with membranes, and anſwer the purpoſe of fins.

Thoſe of oviparous quadrupeds ſerve for progreſſion.

Thoſe of amphibious and cetaceous animals, being ſhort and flat, are fitted for natation. Thoſe of bats, covered with broad membranes, perform the ſame office as wings. In the greater part of quadrupeds, however, they ſerve only for walking. In the quadrumana, the thoracic limbs ſerve for walking and graſping.

In ſome genera of animals the limbs have alſo peculiar uſes: by carnivorous animals they are employed for catching and tearing their prey; by others they are employed for climbing trees, digging in the earth, &c.

In man the thoracic limbs ſerve for apprehen-

ſion, and the pelvian for walking erect: he is the only animal who does ſo.

Thoracic Limbs.

133. *Muſcles which move the ſhoulder on the breaſt.* In man, the muſcles which give motion to the ſhoulder are ſix on each ſide.

A muſcle of a trapezoidal form proceeds on the one hand along the ſpinal apophyſes of the vertebræ of the back, from the ſeventh of the neck to the cervical ligament, and as far as the occiput; and on the other extends along the upper edge of the ſpine of the ſcapula, and is fixed to its acromion apophyſis, and the humeral extremity of the clavicle. The ſuperior part of this muſcle, the fibres of which deſcend obliquely before, elevates the ſhoulder; the middle portion, which has tranſverſe fibres, draws it backwards; the lower part, the fibres of which aſcend by proceeding forwards, tend to lower the ſhoulder. The total action of this muſcle is to pull the ſhoulder backwards; and when it remains fixed it moves the head in the ſame direction, by being connected with the occiput. This muſcle is united to its fellow along the vertebræ, and both together repreſent a ſort of lozenge. DORSO-SUPER-ACROMIAN, *trapezius*.

134. Below this muſcle is a ſmaller one, nearly of a rhomboidal form, which deſcends obliquely from

from the ſpinal apophyſes of the laſt two or three cervical vertebræ, and the firſt three or four of the lumbar, and proceeds along the poſterior edge of the ſcapula below the ſpine of that bone.

This muſcle elevates the baſe of the ſcapula by drawing it backwards; and thus lowers the anterior angle of the ſhoulder. DORSO-SCAPULIAN, *rhomboid.*

135. Higher up than the preceding muſcle is another, which is inſerted in the tranſverſe apophyſes of the firſt four vertebræ of the neck, and deſcends obliquely towards the poſterior angle of the ſcapula to which it is fixed, as well as to the portion of the poſterior edge which is above the ſpine of that bone. This muſcle raiſes the ſhoulder, as the preceding one does, by cauſing it to make a kind of movement like that of a lever, which depreſſes the humeral angle. TRACHELO-SCAPULIAN, *angular.*

136. To the anterior part of the four ribs which follow the firſt, are fixed, near to their cartilages, the ſame number of muſcular digitations, which aſcend obliquely behind, and unite in a flat tendon inſerted in the coracoid apophyſis.

This muſcle carries the ſhoulder forwards, by depreſſing its humeral angle. COSTO-CORACOIDIAN, *anterior ſerrated* or *ſmall pectoral.*

137. Above and between the firſt eight or nine ribs is fixed, by the ſame number of digitations, a large

large muſcle, which becomes narrower, proceeds backwards, paſſing under the ſcapula, and is inſerted in the poſterior edge of that bone.

All the portions of this muſcle tend to draw the ſhoulder ſtrongly forwards, at the ſame time that its upper part raiſes and its lower depreſſes it. COSTO-SCAPULIAN, *large ſerrated.*

138. A ſmall muſcle extends obliquely from the anterior edge of the firſt rib to the middle of the clavicle: ſituated between theſe two bones, it appears that it ought to fix the clavicle. COSTO-CLAVIAN, *ſub-claviar.*

139. A ſimple indication of theſe different muſcular forces, and of the combinations which can be formed of them, ſerves to account for the variety of motions of which the ſhoulder is ſuſceptible. It is to be remarked that the ſhoulder has this peculiarity, that the bone of which it is eſſentially formed is in a manner free, and ſuſpended amidſt muſcles which ſuſtain it, and give it motion; and that it is on this bone that the arm is articulated. In the different actions of the muſcles of the ſhoulder we muſt always keep in mind that the ſcapula is confined by the clavicle, which regulates its progreſs, and often occaſions very compound motions on the principle of the lever.

140. *Muſcles which move the arm on the ſhoulder.*

der. The mufcles which move the arm on the fhoulder are fixed to the bones of the fhoulder, and of the breaft; to thofe of the vertebral column, and even to thofe of the pelvis.

141. To the fternal portion of the clavicle, the fternum, the firft feven or eight ribs and their cartilages, is fixed a broad mufcle, the digitated portions of which extend in a tranfverfe direction over the breaft.

This mufcle, while it proceeds towards the arm, becomes narrower; the inferior fibres are folded back behind, and at the top on the fuperior ones, and terminate in a broad, flat tendon which is inferted on the fuperior quarter of the humerus, along the exterior edge and groove of that bone. This mufcle, which forms the anterior edge of the cavity of the arm-pit, ferves to pull the arm ftrongly forwards, and towards the fides of the breaft, by making it turn on itfelf from without inwards. STERNO-HUMERIAN, *great pectoral*.

142. Above the fhoulder is a thick mufcle, fixed before the humeral extremity of the clavicle, to the acromion, and along a part of the lower border of the ridge of the fcapulum. The fibres of this mufcle pafs above the articulation of the arm with the fhoulder; the anterior and pofterior fibres are folded back under the middle fibres, and they all terminate in a tendon which is

inſerted in the rough line at the bottom of the groove of the humerus. This muſcle elevates ſtrongly the arm. SUB-ACROMIO-HUMERIAN, *deltoid.*

143. From the coracoid apophyſis ariſes a ſmall muſcle, which is fixed within the humerus towards its middle part. It tends to pull the arm forwards, by bringing it near to the trunk. CORACO-HUMERIAN, *coraco-brachial.*

144. The face of the ſcapula, which is above its ridge, ſerves to lodge a muſcle, the carneous fibres of which terminate anteriorly in a tendon, which paſſes above the junction of the acromion with the clavicle, and deſcends to fix itſelf to the trochiter. This muſcle, ſituated below the *ſub-acromio-humerian,* concurs towards the ſame action. SUPERIOR SUPER-SCAPULO-TROCHITERIAN, *ſuper-ſpinal.*

145. Another very broad muſcle, fixed to the ridge of the hip bone and the os ſacrum, aſcends along the ſpinal apophyſes of the lumbar vertebræ and the laſt ſeven of the back: it extends over the laſt four ribs by as many digitations. All the fibres of this muſcle approach each other, and proceed towards the arm, where they terminate in a flat tendon, which is turned round on itſelf, and inſerted at the bottom of the trochin, on the interior edge of the groove. This muſcle envelops the trunk behind: it forms at the top the

poſterior

poſterior edge of the cavity of the arm-pit: by contracting it tends to pull the arm downwards and backwards, making it turn inwardly on its axis. LUMBO-HUMERIAN, *great dorſal* or *very large of the back.*

146. To the inferior angle of the ſcapula is fixed a muſcle, which aſcends obliquely before, and terminates in a flat tendon: this tendon paſſes behind that of the preceding muſcle, around which it turns, and is inſerted on the interior edge of the humerus below its head. The action of this muſcle is analogous to that of the preceding. SCAPULO-HUMERIAN, *large round.*

147. To the face of the ſcapula, ſituated below its ridge, is fixed another muſcle, the fibres of which terminate before and at the top in a tendon that paſſes over the exterior ſide of the head of the humerus, and proceeds to inſert itſelf in the trochiter. This muſcle tends to make the head of the bone turn outwards. INFERIOR SUPER-SCAPULO-TROCHITERIAN, *ſubſpinal,* and *ſmall round.*

148. The interior or coſtal face of the ſcapula receives, in its whole extent, a thick muſcle, which produces before a large tendon that paſſes over the interior ſide of the head of the humerus, and is fixed to the trochin. This muſcle tends to make the head of the humerus turn inwards. SUB-SCAPULO-TROCHINIAN, *ſub-ſcapular.*

149. *Muſcles which move the fore-arm on the arm.*

arm. The fore-arm is moved on the arm backwards and forwards: two mufcles bend it, and one extends it.

150. One of the bending mufcles is compofed of two carneous portions united below. At the top, the interior portion of this mufcle is fixed by a tendon to the coracoid apophyfis; it then defcends to about the lower third of the humerus. The exterior portion exhibits a larger tendon, which furrounds, at the top and within, the edge of the glenoidal cavity of the fcapula: it paffes above the head of the humerus in the infide of the articulation, and, after contracting itfelf, iffues from it to lodge in the groove of that bone, along which it defcends. Thefe two portions unite into one mufcle, which foon becomes narrower, and gives birth to a round tendon: this tendon paffes before the articulation, and is inferted in a tubercle, which is below the neck, and at the interior part of the radius. This mufcle bends the fore-arm on the arm, and by making the radius turn inwards and outwards it contributes to the motion of *fupination.* Scapulo-radian, *biceps.*

151. Before the bone of the arm, at its middle and exterior part, is another thick mufcle which defcends towards the bending of the arm, paffing below the preceding mufcle: it terminates below in a tendon, which is inferted in the coronoid apophyfis of the cubitus: it bends the fore-arm on the arm. Humero-cubitian, *interior brachial.*

Theſe two flexor muſcles are covered with a very thin aponeurotic membrane.

152. Behind the humerus is a broad, thick muſcle, which adheres at the top by three ſeparate portions: one exterior and ſomewhat anterior is fixed below the trochiter: the middle one, which is larger, is fixed by a flat tendon to the anterior edge of the ſcapula, below its glenoidal cavity: the interior and poſterior, which is ſhorter, is inſerted behind, below the head of the humerus. Theſe three portions unite towards the middle of that bone, embrace it, and adhere to it nearly as far as the articulation, where this muſcle changes into a tendon, which paſſes behind the articulation, and is fixed to the olecranon. This muſcle alone extends the fore-arm on the arm. SCAPULO-OLECRANIAN, *brachial triceps.*

153. On the exterior ſide of the olecranon is a very ſmall muſcle, which is fixed to the epicondyle, and proceeds obliquely over the exterior ſide of the os cubitus, in a ſmall part of its extent. The action of this muſcle is very weak. EPICONDYLO-CUBITIAN, *ſmall anconeus.*

154. *Muſcles which make the radius turn on the os cubitus.* Four muſcles make the radius turn on the os cubitus; two of them by pulling it inwards, and two by drawing it outwards.

155. Before, and at the bottom of the epi-

 trochlea,

trochlea, is fixed a mufcle, which defcends obliquely without, to infert itfelf before in the middle of the radius. EPITROCHLEO-RADIAN, *round pronator.*

156. Before the two bones of the fore-arm and below, is placed, in a deep fituation, a thin broad and carneous mufcle, which extends tranfverfely from the interior edge of the cubitus to the exterior edge of the radius. CUBITO-RADIAN, *fquare pronator.*

Thefe two mufcles make the radius bone turn before the cubitus, and thus produce the motion of *pronation.*

157. The bottom of the epicondyle gives birth to a mufcle which adheres alfo to the neighbouring articular ligaments: it proceeds outwards and inwards, around the head and neck of the radius, which it embraces, and defcends to infert itfelf along the interior edge of the fuperior quarter of that bone: it draws the radius outwards. EPICONDYLO-RADIAN, *fhort fupinator.*

158. To the exterior and inferior edge of the humerus, and before its epicondyle, is fixed a flender mufcle, which defcends along the convexity of the radius, and is inferted on the outfide, in the inferior extremity of that bone. This mufcle, which evidently tends to pull the radius outwards when it is before the os cubitus, can alfo draw it inwards when thefe two bones are

are parallel. Humero-super-radian, *long ſupinator.*

Theſe two muſcles pull the radius outwards when it has been drawn before the cubitus: they thus produce the motion of *ſupination.*

The movements of pronation and ſupination are produced, in an eſſential manner, by the action of the radius; but the os cubitus, and even the humerus, yield to theſe motions in a ſenſible manner.

159. *Muſcles which move the wriſt on the fore-arm.* Four muſcles move the wriſt on the fore-arm; two by bending, and two by extending it. On the interior ſide of the fore-arm is a long ſlender muſcle, which is fixed at the top to the humerus behind the epitrochlea, cloſe to the olecranon: it deſcends along the os cubitus, and terminates below in a tendon inſerted before the laſt bone of the firſt row of the carpus *(piſiforme).* Epitrochlo-carpian, *interior cubital.*

160. Before the epitrochlea is fixed another muſcle, which deſcends obliquely on the fore-part of the arm; rejoins the radius, and accompanies that bone two thirds towards its lower part. This muſcle is terminated by a long tendon, which glides in the groove of the firſt bone of the carpus *(unciforme),* and is inſerted in the ſecond bone of the metacarpus. Epitrochlo metacarpian, *interior radial.*

The action of thefe two mufcles tends, in an effential manner, to bend the wrift on the fore-arm.

161. On the exterior fide of the arm is a thick mufcle, which proceeds above from the epicondyle; defcends a little inwards, and is fixed along the exterior edge of the cubitus, to which it ftrongly adheres. This mufcle terminates in a tendon which paffes inferiorly behind the cubitus, and is inferted on the exterior fide of the fuperior extremity of the laft bone of the metacarpus. The action of this mufcle tends to pull the wrift backwards, by inclining it on the cubitus. CUBITO-SUPER-METACARPIAN, *exterior cubital.*

162. On the exterior fide of the arm there are alfo two mufcles, fixed fuperiorly to the epicondyle, which defcend together along the exterior edge of the radius, and become tendinous towards the middle of that bone. Thefe two tendons proceed together towards the lower part of the radius, and in that place feparate: one of them is inferted without on the fummit of the fecond bone of the metacarpus, and the other on the fummit of the third. This double mufcle extends the wrift backwards, by inclining it on the radius. EPICONDYLO-SUPER-METACARPIAN, *firft and fecond exterior radial.*

When thefe three mufcles act together they extend the wrift directly backwards.

163. Of the four mufcles here defcribed (the laft

laſt two being conſidered as one), it is ſeen that the two ſituated before have a tendency to bend the wriſt on the fore-arm, and that the two ſituated behind have a tendency to pull it back: but when the one before, and that behind, ſituated on the exterior edge, act together, they bend the wriſt towards that ſide: the caſe is the ſame with the other two, ſituated on the interior edge. The varied action of theſe four muſcles is ſtill combined with that of the muſcles which ſerve for pronation and ſupination. The variety of the motions that can reſult from the combination of theſe different forces may give ſome idea of the great mobility of which the wriſt is ſuſceptible.

164. The muſcles of the arm are covered with a thin aponeuroſis, which envelops the arm beneath the ſkin: it is confounded above with the tendons of the muſcles, and terminates below towards the articulation of the elbow.

The muſcles of the fore-arm are alſo covered with an aponeuroſis, which is fixed ſuperiorly around the articulation of the elbow, and chiefly to the epitrochlea. This aponeuroſis is very ſtrong on the interior ſide of the fore-arm, where it furniſhes the membranous prolongations which penetrate between the ſcapulo-radian and the humero-cubitian muſcles, and ſupplies them with points of adheſion. It is thin on the exterior ſide of the fore-arm, as well as towards the wriſt, where it entirely diſappears. This aponeuroſis,

aponeurofis, by enveloping the muſcles, confines them, ſupports them, and thus favours their action.

The muſcles, which ſerve for the motion of the fingers, and which extend from the arm and fore-arm to the hand, have tendons which paſs over the circumference of the wriſt. Theſe tendons are ſtrongly retained in that place by an aponeurotic *annular ligament*, broad, and in the form of a bracelet, which prevents them from ſeparating.

The tendons of theſe muſcles are alſo received in that place in ſheaths, or tendinous grooves, along which they glide as far as the lower point, by which they are fixed: of theſe ſheaths ſome are common to ſeveral tendons, and others are peculiar to particular ones.

The muſcles of the inſide of the hand are covered with a very ſtrong *aponeuroſis*, which lies immediately beneath the ſkin. It ſeems to ariſe from the interior part of the annular ligament, and expands on the inſide of the hand as far as the fingers.

The interior face of this *palmar aponeuroſis* ſeems alſo to give birth to membranous prolongations, which form partitions along the bones of the metacarpus, and thus ſeparate the tendons that paſs over theſe parts.

165. The palmar aponeuroſis ſeems to continue itſelf ſuperiorly along with the tendon of a

long and ſlender muſcle, which ſtill remains to be deſcribed. It is fixed above to the epitrochlea: it is carneous for a ſmall ſpace, but ſoon becomes tendinous: the ſlender and flat tendon of this muſcle deſcends along the interior edge of the fore-arm, and paſſes over the interior face of the annular ligament, where it adheres by ſome tendinous fibres: it then expands, and ſeems to loſe itſelf, and to be confounded with the palmar aponeuroſis. This muſcle can contribute to the flexion of the wriſt, and ſeems to be capable of ſtretching the palmar aponeuroſis. EPITROCHLO-PALMIAN, *palmaris longus*, *ſlender cubital.*

166. Beneath the ſkin of the palm of the hand is obſerved alſo a ſmall muſcle, exceedingly thin, the tranſverſe fibres of which ſeem to loſe themſelves under the palmar aponeuroſis, and in the thickneſs of the ſkin: its action muſt be very weak. PALMO-CUTIAN, *palmaris cutaneus.*

167. *Muſcles which produce motion in the fingers.* The muſcles which make the fingers move are very numerous: ſome of then ſerve for bending, and others for extending them; and there are ſome which make them move on all ſides. Some of theſe muſcles are common to ſeveral fingers; others are peculiar to one: ſome of them alſo are very long, and fixed to the fore-arm; while others, much ſhorter, are fixed to the carpus and metacarpus.

168. Along

168. Along the interior part of the fore-arm is a mufcle fixed fuperiorly, by a very thick carneous part, to the epitrochlea, the interior fide of the cubitus, and the fore-part of the radius. This mufcle defcends till towards the middle of that bone, where it feparates into four diftinct portions, which terminate inferiorly in the fame number of thin, flat tendons. Thefe four tendons pafs together before the wrift, and then feparate to proceed to the laft four fingers. They glide before the bones of the metacarpus and the firft phalanges, where thefe fmall tendons are perforated; they then unite, and are fixed along the interior face of the fecond phalanges. This mufcle ferves to bend the fecond phalanges on the firft, the fingers on the hand, and the wrift on the fore-arm. COMMON EPITROCHLO-PHALANGIAN, *fublime* or *perforated flexor*.

169. Below this mufcle is another analogous to it, thin above and thick in the middle. It is fixed along the interior edge of the cubitus, and divides itfelf into four portions, which terminate in as many tendons. Thefe tendons proceed below thofe of the preceding mufcle, as far as the place where the latter are perforated, traverfe the fiffures of them, and are connected to the interior edge of the laft phalanges. This mufcle, which has the fame action as the preceding, can bend alfo the third phalanges, to which it is fixed.

COMMON

COMMON CUBITO-PHALANGETTIAN, *profound* or *perforating flexor.*

170. Towards the ſuperior extremities of the bones of the metacarpus, between the two common flexors of the fingers, are fixed four ſmall muſcles, which proceeding from the tendons of the profound flexor, are inſerted along the interior edge of the firſt phalanges of the fingers. They are auxiliaries to the two muſcles between which they are placed. PALMO-PHALANGIAN, *lumbricales.*

171. The interval comprehended between the bones of the metacarpus is filled, in the inſide, by three ſmall muſcles, which proceed from the carpus to the firſt phalanges. They contribute to bend the fingers. INTERIOR METACARPO-SUPER-PHALANGIAN, *inferior* or *interior inter-oſſeous.*

172. Along the exterior face of the fore-arm is a muſçle fixed to the epicondyle: it grows larger below the point where it is fixed; and when it reaches the middle of the radius, it divides itſelf into four portions, each of which covers its neighbour, and becomes tendinous. Theſe four tendons paſs behind the carpus, and ſeparate from it to proceed to the convex face of the third phalanges of the fingers. This muſcle extends the four fingers which follow the thumb. COMMON EPICONDYLO-SUPER-PHALANGETTIAN; *common extenſor.*

173. The

173. The interval between the bones of the metacarpus is filled up without, by four ſmall muſcles, which proceed from the carpus to the phalanges. They contribute to the extenſion of the fingers. EXTERIOR METACARPO-SUPER-PHALANGIAN, *ſuperior or exterior inter-oſſeous.*

174. Before the upper third of the radius, and along the interior edge of that bone, is fixed a thin muſcle, which terminates below in a flat tendon. This tendon paſſes to the exterior edge of the carpus, and proceeds to the laſt phalanx of the thumb. This muſcle bends the two phalanges of the thumb on the bone of the metacarpus, and even that bone on the carpus. RADIO-PHALANGETTIAN OF THE THUMB, *long flexor of the thumb.*

175. A thick muſcle is fixed to the baſe of the firſt bones of the carpus, paſſes before the firſt, and even the ſecond bone of the metacarpus, and envelops the firſt phalanx of the thumb. It tends to bend the thumb. CARPO-PHALANGIAN OF THE THUMB, *ſhort flexor of the thumb.*

176. To the top of the cubitus, on the outſide and for a part of its length, is fixed a muſcle, the tendon of which paſſes behind the firſt bone of the metacarpus, and is inſerted in the firſt phalanx of the thumb. The action of this muſcle is to extend the thumb. CUBITO-SUPER-PHALANGIAN, *long extenſor of the thumb.*

177. Another

177. Another mufcle, much fhorter and thinner, proceeds in the fame direction, and has the fame action as the preceding: its tendon terminates at the fecond phalanx of the thumb. CUBITO-SUPER-PHALANGIAN OF THE THUMB, *fhort extenfor of the thumb.*

178. Along the interior fide of the third bone of the metacarpus is inferted a mufcle, which proceeds in a tranfverfe direction, and is fixed to the cubital edge of the firft phalanx of the thumb. It brings the thumb towards the other fingers, by pulling it forwards. METACARPO-PHALANGIAN, *adductor of the thumb.*

179. To the exterior face of the cubitus is fixed fuperiorly a mufcle, which extends between the two bones of the fore-arm, and terminates inferiorly in a tendon, often divided, which is implanted in the fummit of the firft bone of the metacarpus, towards its radial fide. This mufcle removes the thumb from the other fingers. CUBITO-SUPER-METACARPIAN OF THE THUMB, *long abductor of the thumb.*

180. A fmall mufcle is inferted before the two firft bones of the two rows of the carpus, and proceeds outwards on the radial edge of the firft phalanx of the thumb, which it embraces. This mufcle removes the thumb from the other fingers. CARPO-SUPER-PHALANGIAN, *fhort abductor.*

181. Before

181. Before the firſt two bones of the two rows of the carpus is fixed a muſcle, which is inſerted on the radial edge of the metacarpian bone of the thumb. This muſcle makes the bone of the metacarpus turn on its axis, and pulls the thumb towards the hollow of the hand, in order to oppoſe it to the other fingers. CARPO-METACARPIAN OF THE THUMB, *metacarpian of the thumb,* or *oppoſer.*

182. To the middle part of the cubitus without is fixed a muſcle, the tendon of which paſſes over the convexity of the hand, to proceed to the laſt phalanx of the index-finger. It extends the index-finger. CUBITO-SUPER-PHALANGETTIAN OF THE INDEX, *extenſor of the index.*

183. A ſmall muſcle, fixed to the projecting part of the laſt bone of the ſecond row of the carpus, proceeds along the cubital edge of the hand, towards the firſt phalanx of the little finger. This muſcle bends the little finger by pulling it a little towards the reſt. CARPO-SUPER-PHALANGETTIAN OF THE LITTLE FINGER, *ſhort flexor of the little finger.*

184. A thin muſcle, attached to the epicondyle, furniſhes a ſecond tendon to the little finger. EPICONDYLO-SUPER-PHALANGETTIAN OF THE LITTLE FINGER, *extenſor of the little finger.*

185. At the lower part of the laſt bone of the firſt

first row of the carpus is fixed a muſcle, which proceeds along the cubital edge of the laſt bone of the metacarpus, and is inſerted in the firſt phalanx of the little finger. This muſcle bends the little finger, by pulling it ſlightly outwards. CARPO-PHALANGIAN OF THE LITTLE FINGER, *abductor of the little finger.*

186. Below the preceding is often found another muſcle, which extends from the cubital edge of the fifth bone of the metacarpus, as far as the projection of the laſt bone of the ſecond row of the carpus, and proceeds along the cubital edge of the hand towards the firſt phalanx of the little finger. This muſcle pulls the little finger before the reſt. CARPO-METACARPIAN OF THE LITTLE FINGER, *oppoſer of the little finger.*

187. As the oſſeous piece which receives the bone of the thigh is not moveable, like that which receives the bone of the arm, it has no muſcles proper for moving it; but it forms a point, to which are attached all thoſe that give motion to the thigh on the pelvis, and a part even of thoſe which move the leg on the thigh.

188. *Muſcles which make the thigh move on the pelvis.* The muſcles which ſerve merely for moving the thigh on the pelvis are attached to the

 trochanter,

trochanter, the *trochantin*, and the *femoral ridge*. Thofe attached to the trochanter form the thicknefs of the hips.

189. The moft voluminous, that which covers the reft, is attached above, along the pofterior half of the edge of the hip bone; it defcends behind along that edge, and along that of the facrum and coccyx. All the fibres of this mufcle approach each other, and terminate inferiorly in a broad tendon which is inferted behind the femur, below the trochanter. This mufcle ferves to pull the thigh backwards and outwards. SACRO-FEMORIAN, *gluteus maximus*.

This mufcle, the fize of which is confiderable in man, is proportionally fmaller in apes and the other mammalia; fo that thefe prominences, called buttocks, are found only in man.

190. Below this mufcle, but placed more forwards, is another of lefs fize, the form and direction of which are nearly the fame: it is fixed to the exterior face of the hip bone, and along the anterior half of its edge. Its fibres terminate inferiorly in a fort of tendon, which is inferted in the fummit of the trochanter. Its action is nearly the fame as that of the preceding. GREAT ILIO-TROCHANTERIAN, *gluteus medius*.

191. Below the preceding is alfo another fmaller

ſmaller muſcle, which adheres to the exterior face of the broad portion of the hip bone: its fibres terminate inferiorly in a flat tendon, which is inſerted before the ſummit of the trochanter. Its action is the ſame as that of the preceding. SMALL ILIO-TROCHANTERIAN, *gluteus minimus.*

192. On the ſides of the interior face of the os ſacrum, between the holes of that bone, is attached, by three or four digitations, a muſcle, which being broad in that place paſſes through the leſſer pelvis by the iſchiatic notch: it then becomes narrower, and deſcends obliquely to inſert itſelf by a long tendon in the ſummit of the cavity of the trochanter. This muſcle makes the thigh turn outwards, when extended, and removes it when bent. SACRO-TROCHANTERIAN, *pyriformis.*

193. Two other muſcles are fixed along the poſterior edge of the iſchium, and are inſerted together in the ſummit of the cavity of the trochanter: they have the ſame action as the preceding. ISCHIO-TROCHANTERIAN, *gemini.*

194. In the inſide of the leſſer pelvis, along the interior edge of the ſub-pubian foramen, is fixed a broad muſcle, which changes into a flat tendon. This tendon turns round on the notch which is between the ſpine and the tuberoſity of the iſchium; then paſſes between the two preceding

 muſcles,

mufcles, as in a fheath, and is inferted in the fummit of the trochanter. This mufcle has the fame action as the preceding, and exercifes it by gliding on the notch of the ifchium as on a fulcrum. INTERIOR SUB-PUBIO-TROCHANTERIAN, *interior obturator.*

195. A fmall flat mufcle, applied before and around the fub-pubian foramen, proceeds backwards by a tendon, which paffes below the cotyloid cavity, and is inferted behind the neck of the femur, in the cavity of the trochanter. This mufcle has the fame action as the preceding. EXTERIOR SUB-PUBIO-TROCHANTERIAN, *exterior obturator.*

196. To the tuberofity of the ifchium is fixed a thin flat mufcle, which is inferted behind the trochanter: its action is the fame as the preceding. It tends to make the thigh turn outwards. ISCHIO-SUB-TROCHANTERIAN, *fquare of the thigh.*

The other mufcles proceed from the pelvis to the trochantin, and the femoral ridge; they are placed at the interior and fuperior part of the thigh.

197. To the fides of the bodies of the lumbar vertebræ and the bafe of their tranfverfe apophyfes is fixed a thick mufcle, which defcends, growing fmaller, and proceeds laterally on the iliac portion of the hip bones: it then advances towards

towards the pubis, and paſſes above the arch which that bone forms above the ſub-pubian foramen. This muſcle then glides on the interior ſide of the articulation of the femur, which it covers, turns round below the neck of that bone, and terminates before the trochantin. It bends the thigh forwards on the pelvis. PRÆLUMBO-TROCHANTINIAN, *pſoas.*

198. A broad thick muſcle, attached to the circumference of the os ilium, and to a part of its interior face, deſcends anteriorly towards the pubis, and terminates there in a tendon which is united to that of the preceding muſcle, as far as its inſertion into the trochantin. It has the ſame action. ILIO-TROCHANTINIAN, *iliac.*

199. Below the ſymphyſis of the pubis is fixed a thin muſcle, which deſcends before that bone, and proceeds backwards in an oblique direction to inſert itſelf, by a flat tendon, behind the trochantin. It has the ſame action as the two preceding. SUPER-PUBIO-FEMORIAN, *pectinalis.*

200. Three muſcles are attached before the pelvis: the firſt towards the ſymphyſis of the pubis; the ſecond below, in the fore-part of that bone cloſe to the ſub-pubian foramen; the third ſtill lower, before and above the tuberoſity of the iſchium. Theſe three muſcles proceed behind the thigh, and are inſerted along the femoral

 ridge,

ridge, in ſuch a manner that the firſt paſſes before the ſecond, and is inſerted farther down into the femur. The third deſcends lower than the other two, and is fixed about the lower third of that bone. Theſe muſcles pull the thighs inwards, by bringing them towards each other. PUBIO-, SUB-PUBIO-, and ISCHIO-FEMORIAN, *the three adductors,* or *femoral triceps.*

201. *Muſcles which move the leg on the thigh.* The greater part of the muſcles which ſerve to move the leg on the thigh are attached to the pelvis, and ſome of them to the femur: thoſe which extend the leg on the thigh are fixed to the rotula; thoſe which bend it are almoſt all attached to the interior ſide of the head of the tibia.

202. A muſcle ſituated before the thigh adheres ſuperiorly by two tendons: one, which is ſhort, to the tubercle placed before the edge of the ilium and above the cotyloid cavity; the other to the circumference of that cavity. This muſcle becomes thick in the middle, then contracts, and terminates in a flat tendon, which is inſerted in the ſummit of the rotula. It extends the leg. ILIO-ROTULIAN, *ſtraight* or *ſlender anterior.*

203. Below this muſcle is another very broad and thick one, which envelops the femur before and on the ſides. This muſcle is ſeparated ſuperiorly

riorly into three portions: the middle portion is fixed before the trochantin; the interior, attached to the ſame place, deſcends along the femoral ridge, and along that which proceeds to the interior condyle: the exterior portion is attached before and at the bottom of the trochanter, and continues along the exterior edge of the femoral ridge, and the ridge which deſcends to the exterior condyle. Theſe three portions unite in the middle of the thigh, and terminate in a large flat tendon, which is inſerted in the ſummit of the rotula. This muſcle by its action ſtrongly extends the thigh. TRI-FEMORO-ROTULIAN, *vaſt interior*, *vaſt exterior*, and *crural*; or *crural triceps*.

The muſcles which bend the leg are more numerous.

204. Before the tuberoſity of the iſchium is attached a very ſtrong and tendinous muſcle, the tendon of which is continued backwards obliquely, as far as the middle of the thigh, where it becomes carneous. This muſcle deſcends before the poſterior part of the interior condyle of the femur, where it is changed into a flat divided tendon, which is fixed behind the interior condyle of the head of the tibia. This muſcle bends the leg. ISCHIO-SUB-TIBIAN, *ſemi-membranous*.

205. Behind the tuberoſity of the iſchium is fixed a muſcle, which is carneous as far as the

lower third of the thigh, where it is changed into a ſlender round tendon, which paſſes behind the interior condyles of the femur and the tibia, turns itſelf inwards around the latter, and is inſerted in the upper part of the tibia near its anterior edge. It has the ſame action as the preceding. ISCHIO-PRÆTIBIAN, *ſemi-nervous*.

In apes the two preceding muſcles are fixed to the tibia, much lower down than in man, and keep the leg in a continual ſtate of flexion, which prevents walking erect.

206. On the outſide of the thigh behind, is a muſcle divided inferiorly into two portions: one longer than the other is fixed to the bottom of the tuberoſity of the iſchium by a broad tendon, which deſcends obliquely behind; becomes broader and unites towards the middle of the thigh with the ſhort carneous portion: the latter is inſerted in the middle of the femoral ridge; continues along this ridge, and that which proceeds to the exterior condyle. This muſcle terminates in a ſtrong tendon, which paſſes behind the exterior ſide of the knee, and is inſerted in the head of the perone. It bends the leg. ISCHIO-PERONIAN, *femoral biceps*.

207. Behind the articulation of the knee is a ſhort muſcle, deeply ſituated between the bottom of the exterior condyle of the femur, behind the articular

articular capſule, and the poſterior and ſuperior part of the tibia. It tends alſo to bend the leg. Poplito-tibian, *poplitean.*

208. To the anterior angle of the ridge of the ilium is fixed a thin and very long muſcle, which deſcends before the thigh; paſſes on the interior ſide of the knee, and is inſerted in the upper part of the tibia, on the interior ſide of its ridge, below the tuberoſity of that bone. This muſcle bends the leg on the thigh by pulling it inwards, as if to make it croſs the other; it makes the thigh and leg alſo turn outwards when the member is extended. Ilio-prætibian, *(taylor muſcle,) ſartorius.*

209. A thin long muſcle attached before the iſchium and the pubis, by a broad flat tendon, deſcends along the interior part of the thigh, and terminates in a round ſlender tendon, which paſſes behind the condyles of the femur and the tibia. This muſcle then turns round on the interior ſide of the knee, and is inſerted in the top of the ridge of the tibia, near its tuberoſity. It bends the leg. Pubio-prætibian, *ſlender* or *ſtraight interior.*

210. All the muſcles of the thigh are enveloped and maintained in their poſitions, by a very ſtrong ſort of aponeurotic covering, which extends over the pelvis before the pubis, the iſchium, the anterior

terior angle of the ilium, the exterior face of that bone, that of the facrum and the coccyx, and over the articulation of the head of the femur. This *femoral aponeurofis* is very ftrong on the exterior fide of the thigh; adheres behind along the femoral ridge, and defcends on the knee, which it envelops on all fides. It fends out prolongations between the mufcles, and feparates them without adhering to them. It ftrongly fecures the mufcles which it envelops, furnifhes them with a firm point of fupport during their contraction, and in this manner greatly contributes to favour their action.

This aponeurofis exhibits at its upper part two diftinct laminæ, between which is lodged a particular mufcle. This mufcle is fixed towards the top of the anterior angle of the ilium, and defcends between the two laminæ of the aponeurofis as far as the middle of the thigh. The principal action of this mufcle is to ftretch the aponeurofis, and thus to fuftain with more force the mufcles of the thigh. APONEUROTIC ILIO-FEMORIAN, *mufcle of the fafcia lata*, and *aponeurofis of the fafcia lata.*

211. *Mufcles which move the foot on the leg.* The mufcles which make the foot move on the leg extend, and bend it, or pull it to either fide.

The feet are extended by the mufcles which form the calf of the leg. Two of thefe mufcles

are placed close to each other: the interior, which is thicker and longer, is fixed behind the interior condyle of the femur; and the exterior behind the exterior condyle of that bone: both of them become very thick along the upper half of the leg; they then decrease, are confounded, and terminate in an exceedingly strong and thick flat tendon which is inserted behind the calcaneum. Their action is to extend strongly the foot on the leg. BI-FEMORO-CALCANIAN, *gemellus*, *gastrocnemian*.

212. Below these two muscles is another, also very thick, which is fixed at the top, behind the head of the perone, and below that of the tibia. This muscle becomes very broad, and descends behind along the tibia, to which it adheres in a small part of its extent: its inferior tendon is confounded with that of the preceding muscle, and both have the same action. TIBIO-CALCANIAN, *soleus*.

These muscles, the gemellus, and the soleus, are those which exercise the most essential action in progression, running and jumping. By extending the foot, these muscles raise the heel and elevate the body, which for a moment rests only on the point of the foot. The carneous swelling of these muscles, which constitutes the calf of the leg, is observed only in man: this structure, by increasing the strength of the leg, adds greatly to the beauty of its form.

213. There

213. There is alfo another very *flender* mufcle which is attached on the fide of the exterior condyle of the femur; it is carneous in its upper fourth, then changes into a fmall tendon which defcends between the two preceding mufcles, and is confounded with them below on the interior edge of their common tendon. It exercifes the fame action. FEMORO-CALCANIAN, *tibial* or *flender plantaris.*

In apes, the tendon of this mufcle does not adhere to the calcaneum, but paffes below, and continues with the aponeurofis plantaris, as the *epitrochlo-palmaris* continues with the *aponeurofis palmaris* in man; fo that thefe animals cannot place their heel on the ground without bearing on this tendon, which prevents them from refting the whole fole of their foot on the ground: a condition neceffary for walking on two feet.

214. Below and behind the upper articulation of the bones of the leg is attached a mufcle which defcends along thefe bones, and adheres to them: it is terminated inferiorly by a tendon which paffes on the interior fide of the malleolus, and is inferted on the interior fide of the os fcaphoides and of the firft os cuneiforme. This mufcle extends the foot, by pulling it inwards. TIBIO-SUB-TARSIAN, *tibialis pofticus.*

215. On the fide of the tibia, below its exte-

rior condyle, is attached a muſcle which proceeds on the exterior ſide of the perone, and adheres to it for three-fourths of its length at the upper extremity. This muſcle is bulky in the middle, and terminates below in a tendon, which paſſes behind the exterior malleolus, glides on the ſide of the calcaneum, then proceeds below the os cuboides, and paſſes obliquely below the foot to inſert itſelf under the tarſian extremity of the firſt bone of the metatarſus. This muſcle extends the foot and pulls it outwards. PERONÆO-SUB-TARSIAN, *long peronæus*.

216. Before the leg, and a little on the outſide, is a muſcle attached ſuperiorly along two-thirds of the exterior edge of the ridge of the tibia. This muſcle terminates inferiorly in a tendon, which proceeding obliquely on the inſide, paſſes before the articulation of the foot, and is inſerted on the interior ſide of the firſt os cuneiforme. It bends the foot by pulling it gently outwards. TIBIO-SUB-TARSIAN, *anterior tibial.*

217. Before and on the exterior ſide of the lower two-thirds of the perone is fixed a muſcle, the lower tendon of which paſſes behind the exterior malleolus in a groove, common to it with the preceding muſcle. This tendon proceeds on the exterior ſide of the calcaneum, before and along the exterior edge of the os cuboides, and is inſerted

inſerted in the tuberoſity which ſerves as the tarſian extremity of the fifth bone of the metatarſus. This muſcle bends the foot by drawing it outwards. GREAT PERONÆO-SUPER-TARSIAN, *middle peronæus.*

218. Before the lower half of the perone is attached a muſcle, thin at the top and thicker in the middle: the tendon in which it terminates deſcends before the convexity of the foot, paſſes in a groove common to it with another muſcle, and proceeds on the outſide to inſert itſelf along the exterior edge of the fifth bone of the metatarſus. The action of this muſcle is the ſame as that of the preceding. SMALL PERONÆO-SUPER-TARSIAN; *ſmall peronæus.*

219. The muſcles of the leg are enveloped in an aponeuroſis, very ſtrong before, but much thinner behind, and particularly below, where it diſappears. This *tibial aponeuroſis* is attached ſuperiorly around the knee, where it ſeems to be confounded with that of the thigh: its anterior face throws out membranous prolongations, which are interpoſed between the muſcles of the anterior part of the leg, and adhere to it.

The tendons of all the muſcles, which proceed from the leg to the foot, are ſecured by two *annular ligaments*, ſimilar to that which, as already ſaid, ſurrounds the wriſt in the form of a bracelet. One of

of theſe ligaments is at the bottom of the leg, and the other above the foot: they ſecure the tendons, which they cover and confine in their places.

Below the foot is an aponeuroſis, ſimilar to the aponeuroſis palmaris. It begins under the calcaneum, where it is very thick, and proceeds expanding itſelf towards the anterior extremity of the bones of the metatarſus. This aponeuroſis plantaris is furniſhed with ſeveral prolongations, which penetrate between the muſcles, ſupply them with numerous points of adheſion, and are fixed on the ſide of the articulations of the bones of the metatarſus with the firſt phalanges of the toes.

220. *Muſcles which give motion to the toes.* The muſcles of the toes, like thoſe of the fingers, are exceedingly numerous: they bend or extend the toes, or make them move towards the ſides. They are common to ſeveral toes, or are peculiar to ſome: in a word, they are affixed to the bones of the leg, or to thoſe of the foot.

221. A muſcle, attached behind and towards the upper part of the tibia, is changed towards the lower part of that bone into a tendon, which paſſes in a groove behind the interior malleolus: it deſcends below the calcaneum, and proceeds outwards beneath the middle of the foot: in that place it receives a fleſhy expanſion, which ariſes from the calcaneum (acceſſory or ſquare portion): this

this tendon then divides itſelf into four ſmall flat tendinous bands, which proceed towards the heads of the metatarſus, where they enter a groove common to four other perforated tendons, through which they paſs, to proceed to the bottom of the third phalanges of the laſt four toes. It bends or depreſſes the toes. COMMON TIBIO-PHALANGETTIAN, *common long flexor of the toes.*

222. Below the large tuberoſity of the calcaneum is fixed a muſcle, which proceeds before and divides itſelf into four tendons: the extremities of theſe tendons are cleft to afford a paſſage to thoſe of the preceding muſcle, and they are inſerted in the ſecond phalanges of the laſt four toes. The action of this muſcle is the ſame as that of the preceding. COMMON CALCANEO-SUB-PHALANGETTIAN, *common ſhort flexor of the toes.*

223. The interval comprehended between the bones of the metatarſus is occupied inferiorly by three ſmall muſcles, analogous to thoſe between the bones of the metacarpus; they contribute to the flexion of the laſt four toes. INFERIOR METATARSO-INTER-PHALANGIAN, *inferior inter-oſſeous.*

224. Between the common flexors are four ſmall muſcles, as in the hand: they proceed from the tendons of the long flexor, and are inſerted below and on the interior ſide of the firſt phalanges

langes of the laſt four toes. They bend theſe parts, by bringing them near the great toe. PLANTI-SUB-PHALANGIAN, *lumbrical.*

225. Below the exterior condyle of the tibia is attached a muſcle which deſcends and adheres along the interior face of that bone; along the interior edge of the perone, and on the inter-oſſeous ligament. On its paſſage it divides itſelf into three parts, which terminate in tendons: theſe tendons deſcend on the convexity of the foot, and paſs in the groove which receives that of the ſmall PERONEO-SUPER-TARSIAN. One of theſe tendons divides itſelf into two, which are fixed on the phalanges of the two toes, next to the great toe: the other two are inſerted in thoſe of the laſt two toes. This muſcle extends or ſtraightens the toes. COMMON PERONEO-SUPER-PHALANGETTIAN, *common long extenſor of the toes.*

226. On the exterior face of the large tubero-ſity of the calcaneum is attached a muſcle, which proceeds inwards obliquely on the foot: it be-comes broader and divides itſelf into four tendons, which croſs and paſs under thoſe of the preced-ing muſcle, with which they are fixed on the firſt phalanges of the laſt four toes. This muſcle ex-tends theſe toes by pulling them outwards. COM-MON CALCANEO-SUPER-PHALANGETTIAN, *pedious* or *ſhort common extenſor of the toes.*

227. The intervals between the bones of the

metatarſus are filled ſuperiorly by four ſmall muſcles, analogous to thoſe found between the bones of the metacarpus; they contribute to the extenſion of the laſt four toes. SUPERIOR METATARSO-INTER-PHALANGIAN, *ſuperior inter-oſſeous.*

228. A ſmall muſcle is attached in a tranſverſe direction below and between the articulation of the bones of the metatarſus with the firſt phalanges; it brings together the heads of theſe bones, and cauſes them to form an arch. TRANSVERSE METATARSO-SUB-PHALANGIAN, *tranſverſe of the toes.*

229. Behind the lower two-thirds of the perone is attached a thin muſcle, the tendon of which deſcends obliquely on the inſide, paſſes behind the lower extremity of the tibia; glides in a groove, which is behind the aſtragalus, and proceeds to the interior ſide of the calcaneum of the foot, to fix itſelf on the interior ſide of the laſt phalanx of the great toe. It bends that toe. PERONEO-SUB-PHALANGETTIAN OF THE GREAT TOE, *long flexor of the great toe.*

230. Under the interior edge of the tarſus, and principally below the firſt os cuneiforme, is attached a thick muſcle, which advances and divides itſelf into two parts; theſe parts diverge from each other, and terminate in two tendinous portions, which are inſerted under the firſt phalanx of the great toe. This muſcle bends that part.

part. TARSO-SUB-PHALANGIAN OF THE GREAT TOE, *ſhort flexor of the great toe.*

231. Before the perone, and along its lower half, is attached a muſcle the tendon of which paſſes over the foot, and is inſerted on the two phalanges of the great toe; it extends that part. PERONEO-SUPER-PHALANGETTIAN OF THE GREAT TOE, *extenſor of the great toe.*

232. On the interior ſide of the large tuberoſity of the calcaneum is attached a muſcle, which proceeds before, along the interior and inferior edge of the foot, and is fixed by a tendon below and on the ſide of the firſt phalanx of the great toe. It bends that part, by pulling it from the other toes. CALCANEO-SUB-PHALANGIAN OF THE GREAT TOE, *abductor of the great toe.*

233. Below the laſt two cuneiform bones, and the heads of the bones of the metacarpus correſponding to them, is a muſcle which paſſes before and inwards, and by a tendon proceeds to the exterior ſide of and below the firſt phalanx of the great toe. It bends that part by pulling it towards the other toes. METATARSO-SUB-PHALANGIAN OF THE GREAT TOE, *abductor of the great toe.*

234. On the exterior ſide of and below the laſt bone of the metaçarpus, is a very ſmall muſcle, which proceeds under the firſt phalanx of the

 little

little toe. It bends that part. TARSO-SUB-PHALANGIAN OF THE LITTLE TOE, *ſhort flexor of the little toe.*

235. On the exterior ſide of the calcaneum, before its ſmall tuberoſity, is attached a muſcle, which proceeds along the exterior and inferior edge of the foot: its tendon furniſhes a tendinous portion, which is fixed behind the large head of the laſt bone of the metacarpus; then continues along that bone, and is inſerted below and on the outſide of the firſt phalanx of the little toe. It bends that part by pulling it from the other toes. CALCANEO-SUB-PHALANGIAN OF THE LITTLE TOE, *abductor of the little toe.*

236. The muſcles are compoſed of bundles of fibres; each muſcle, each fibre, and each ſubdiviſion, is ſeparated by a cellular covering; the fibres are divided and ſubdivided into ſmaller fibres; and this indefinite ſubdiviſion always eſcapes the eye, even when aſſiſted by the beſt microſcope; ſo that the real intimate ſtructure of the muſcular fibre is unknown.

To determine the chemical compoſition of the muſcular fleſh, it may be analyſed in the following manner: Suffer the fleſh to macerate well in cold water, and when it is taken out, heat the water, and there will be coagulated a certain quantity of albumen, which is ſeparated by filtration.

The

The flesh thus deprived of a part of its albumen must then be boiled in a large quantity of water, employing that in which it was first heated. When the ebullition has been maintained for a considerable time, there will be still coagulated a small portion of albumen, which may be separated : a certain quantity of fat also will be disengaged, which must be separated by cooling.

The muscle then exhibits only a coriaceous substance, which is fibrous matter. The water still contains a large quantity of gelatin, which must be precipitated by the tanning principle : several saline substances are also found in this water in small quantity.

The white fibrous parts by very long ebullition are reduced almost entirely to gelatin.

TABLE OF THE MUSCLES

OF THE TRUNK, THE HEAD, AND LIMBS.

MUSCLES WHICH MOVE THE VERTEBRAL COLUMN,

By raising it up and pulling it backwards.

NEW NAMES.	OLD NAMES.
1. Sacro-spinian.	*Sacro-lumbar. Long dorsal and its accessory, or great transverse of the neck. Transverse spinous.*
2. Inter-spinian.	*Inter-spinous.*

By bending it towards the sides.

3. Inter-transversian.	*Inter-transverse.*

By bending the neck forwards.

4. Prædorso-atloidian.	*Long of the neck.*

By bending the spine on the pelvis.

5. Pubio-prælumbian.	*Small psoas.*
6. Ilio-transversian.	*Square of the loins.*

By pulling the coccyx backwards.

7. Ischio-coccygian.	*The same.*

MUSCLES WHICH MOVE THE BREAST,

By raising the ribs.

1. Inter-costian.	*Intercostal, interior and exterior.*
2. Trachelo-costian.	*Scalene.*
3. Transverso-costian.	*Elevators of the ribs.*
4. Dorso-costian.	*Small indented posterior, superior.*

By depressing the ribs.

5. Lumbo-costian.	*Small indented posterior, inferior.*
6. Sterno-costian.	*Triangular of the sternum.*

By dilating and contracting the breast, and separating it from the lower belly.

7. Diaphragm.	*The same.*

By bending the breast on the pelvis, and forming the sides of the abdomen.

8. Ilio-pubio-costian.	*Exterior oblique, or great oblique.*
9. Ilio-costian.	*Interior oblique, or small oblique.*
10. Pubio-sternian.	*Right of the lower belly.*
11. Lumbo-abdominal.	*Transverse of the lower belly.*
12. Pubio-sub-umbilical.	*Pyramidal.*

MUSCLES

MUSCLES WHICH MAKE THE HEAD MOVE ON THE NECK,

By bending it forwards, and towards the sides.

NEW NAMES.	OLD NAMES.
1. Sterno-mastoidian.	*The same.*
2. Great-trachelo-sub-occipitian.	*Great straight, anterior.*
3. Small-trachelo-sub-occipitian.	*Small straight, anterior.*
4. Atloido-mastoidian.	*Small straight, lateral.*

By bending it backwards, and towards the sides.

5. Cervico-mastoidian.	*Splenius of the head.*
6. Trachelo-occipitian.	*Great complexus, and digastric of the neck.*
7. Trachelo-mastoidian.	*Small complexus, or lateral mastoidian.*
8. Atloido-sub-mastoidian.	*Superior oblique, or small oblique.*
9. Axoido-occipitian.	*Great straight, posterior.*
10. Atloido-occipitian.	*Small straight, posterior.*

MUSCLES WHICH MOVE THE FACE,

By corrugating the forehead, and raising the eye-brows and eye-lids.

1. Occipito-frontian.	*Epicranian and pyramidal of the nose.*
2. Fronto-superciliar.	*Superciliar.*
3. Orbito-palpebralian.	*Elevator of the eye-lids.*

By shutting the eye-lids.

4. Palpebralian.	*Orbicular of the eye-lids.*

By dilating and depressing the nostrils.

5. Super-maxillo-nasian.	*Transverse of the nose.*
6. Alveolo-nasian.	*Myrtiform.*

By distending the cheeks.

7. Bucco-labian.	*Buccinator.*

By drawing the lips upwards and backwards.

8. Zygomato-labian, great and small.	*Great and small zygomatic.*
9. Super-maxillo-labian, 1st. great, 2d. middle, 3d. small.	*1st. Elevator of the ala of the nose, and upper lip.* *2d. Incisive, or proper elevator of the upper lip.* *3d. Canine, or elevator of the angle of the lips.*

By depressing the lower lip.

10. Mento-labian.	*Square of the point of the chin.*
11. Maxillo-labian.	*Triangular, or depressor of the angle of the lips.*

By contracting the aperture of the mouth.

12. Labian (single).	*Orbicular of the lips, or small incisive of the upper and lower lip.*

By elevating the lower jaw.

13. Temporo-maxillian.	*Crotaphite, or temporal.*
14. Zygomato-maxillian.	*Masseter.*
15. Great pterygo-maxillian.	*Great pterygoidian, or interior.*
16. Small pterygo-maxillian.	*Small pterygoidian, or exterior.*

NEW NAMES.	OLD NAMES.
	By depressing the lower jaw.
17. Mastoido-genian.	Digastric*.
	A muscle almost without action, situated under the skin of the neck.
18. Thoraco-facian.	Cutaneus.

MUSCLES WHICH MOVE THE SHOULDER ON THE BREAST,

By pulling it backwards.

1. Dorso-super-acromian.	Trapezium.
2. Dorso-scapulian.	Rhomboideus.
3. Trachelo-scapulian.	Angular.

By pulling it forwards.

4. Costo-coracoidian.	Anterior indented, or small pectoral.
5. Costo-scapulian.	Great indented.
6. Costo-clavian.	Sub-clavian.

MUSCLES WHICH MOVE THE ARM ON THE SHOULDER,

By pulling forwards.

1. Sterno-humerian.	Great pectoral.

By pulling it upwards.

2. Sub-acromio-humerian.	Deltoid.
3. Coraco-humerian.	Coraco-brachial.
4. Super-scapulo-trochiterian, superior. . .	Super-spinous.

By pulling it backwards.

5. Lumbo-humerian.	Great dorsal, or very large of the back.
6. Scapulo-humerian.	Great round.

By making it turn outwards.

7. Super-scapulo-trochiterian, inferior. . .	Subspinous and small round.

By making it turn inwards.

8. Sub-scapulo-trochinian.	Sub-scapular.

MUSCLES WHICH MOVE THE FORE-ARM ON THE ARM,

By bending it.

1. Scapulo-radian.	Biceps.
2. Humero-cubitian.	Brachial, interior.

By extending it.

3. Scapulo-olecranian.	Brachial triceps.
4. Epicondylo-cubitian.	Small anconeus.

* The other muscles which lower the jaw are attached to the os hyoides: a description of them will be found under the head *System of Digestion.*

MUSCLES WHICH MAKE THE OS RADIUS TURN ON THE OS CUBITUS,

By carrying it forwards for pronation.

NEW NAMES.	OLD NAMES.
1. Epitrochlo-radian.	*Round pronator.*
2. Cubito-radian.	*Square pronator.*

By pulling it outwards for supination.

3. Epicondylo-radian.	*Short supinator.*
4. Humero-super-radian.	*Long supinator.*

MUSCLES WHICH MOVE THE CARPUS OR WRIST ON THE FORE-ARM,

By bending it.

1. Epitrochlo-carpian.	*Cubital, interior.*
2. Epitrochlo-metacarpian.	*Radial interior.*

By pulling it backwards.

3. Cubito-super-metacarpian.	*Cubital, exterior.*
4. Epicondylo-super-metacarpian 1st and 2d.	*Radial, exterior 1st and 2d.*

Brachial, anti-brachial and palmar aponeurosis; annular ligament; muscles which seem to act on the palmar aponeurosis.

5. Epitrochlo-palmar.	*Slender cubital, long palmar.*
6. Palmo-cutian.	*Cutaneous palmar.*

MUSCLES WHICH CONTRIBUTE TO THE MOTION OF THE FINGERS,

By bending the last four fingers.

1. Common epitrochlo-phalangian.	*Sublime or perforated flexor.*
2. Common cubito-phalangettian.	*Profound or perforating flexor,*
3. Palmo-phalangian.	*Lumbrical.*
4. Metacarpo-phalangian, interior.	*Interosseous interior or inferior.*

By extending the last four fingers.

5. Epicondylo-super-phalangettian, common.	*Common extensor of the fingers.*
6. Metacarpo-phalangian, exterior.	*Interosseous, superior or exterior.*

By bending the thumb.

7. Radio-phalangettian of the thumb.	*Long flexor of the thumb.*
8. Carpo-phalangian of the thumb.	*Short flexor of the thumb.*

By extending the thumb.

9. Cubito-super-phalangettian of the thumb.	*Long extensor of the thumb.*
10. Cubito-super-phalangian of the thumb.	*Short extensor of the thumb.*

By bringing the thumb nearer the other fingers.

11. Metacarpo-phalangian of the thumb.	*Adductor of the thumb.*

By

By removing the thumb from the other fingers.

NEW NAMES.	OLD NAMES.
12. Cubito-super-metacarpian of the thumb.	*Long abductor of the thumb.*
13. Carpo-super-phalangian of the thumb.	*Short abductor of the thumb.*

By carrying the thumb before the other fingers.

14. Carpo-metacarpian of the thumb.	*Metacarpian of the thumb, or opposer.*

By extending the index finger.

15. Cubito-super-phalangettian of the index.	*Proper extensor of the index.*

By bending the little finger.

16. Carpo-super-phalangettian of the little finger.	*Short flexor of the little finger.*

By extending the little finger.

17. Epicondylo-super-phalangettian of the little finger.	*Proper extensor of the little finger.*

By removing the little finger from the rest.

18. Carpo-phalangian of the little finger.	*Abductor of the little finger.*
19. Carpo-metacarpian of the little finger.	*Opposer of the little finger.*

MUSCLES WHICH MAKE THE THIGH MOVE ON THE PELVIS.

By pulling it backwards and outwards.

1. Sacro-femorian.	*Gluteus maximus.*
2. Greater ilio-trochanterian.	*Gluteus medius.*
3. Lesser ilio-trochanterian.	*Gluteus minimus.*

By making it turn outwards.

4. Sacro-trochanterian.	*Pyramidal.*
5. Ischio-trochanterian.	*Gemini.*
6. Sub-pubio-trochanterian, interior.	*Interior obturator.*
7. Sub-pubio-trochanterian, exterior.	*Exterior obturator.*
8. Ischio-sub-trochanterian.	*Square of the thighs.*

By bending it forwards.

9. Prælumbo-trochantinian.	*Psoas.*
10. Ilio-trochantinian.	*Iliac.*
11. Super-pubio-femorian.	*Pectinalis.*

By pulling it inwards.

12. Pubio-, sub-pubio-, and Ischio-femorian.	*Three adductors, or triceps adductor.*

MUSCLES WHICH MOVE THE LEG ON THE THIGH.

By extending it.

1. Ilio-rotulian.	*Straight or slender anterior.*
2. Trifemoro-rotulian.	*Vast interior, vast exterior, and crural or triceps crural.*

By

By bending it.

NEW NAMES.	OLD NAMES.
3. Ischio-sub-tibian.	*Semi-membranous.*
4. Ischio-prætibian.	*Semi-tendinous.*
5. Ischio-peronean.	*Biceps.*
6. Poplito-tibian.	*Poplitian.*

By bending it and pulling it inwards.

7. Ilio-praetibian.	*Sartorius.*
8. Pubio-praetibian.	*Slender interior.*

FEMORAL APONEUROSIS AND MUSCLE WHICH ACTS ON IT,

By contracting it.

1. Aponeurotic-ilio-femorian.	*Muscle of the fascia lata.*

MUSCLES WHICH MAKE THE FOOT MOVE ON THE LEG,

By extending it.

1. Bi-femoro-calcanean.	*Gemellus, gastrocnemius.*
2. Tibio-calcanean.	*Soleus.*
3. Femoro-calcanean.	*Tibialis or slender plantaris.*

By extending it and pulling it inwards.

4. Tibio-sub-tarsian.	*Tibialis posticus.*

By extending it and pulling it outwards.

5. Peroneo-sub-tarsian.	*Long peroneus.*

By bending it.

6. Tibio-sub-tarsian.	*Tibialis anticus.*

By bending it and pulling it outwards.

7. Greater peroneo-super-tarsian.	*Middle peroneus.*
8. Less peroneo-super-tarsian.	*Less peroneus.*

Tibial and plantar aponeurosis and annular ligaments.

MUSCLES WHICH SERVE TO MOVE THE TOES,

By bending the last four toes.

1. Tibio-phalangettian, common.	*Long common flexor.*
2. Calcaneo-sub-phalangettian, common.	*Short common flexor.*
3. Metatarso-inter-phalangian, inferior.	*Inferior interosseous.*
4. Planti-sub-phalangian.	*Lumbrical.*

By straightening the last four toes.

5. Peroneo-super-phalangettian, common.	*Long common extensor of the toes.*
6. Calcaneo-super-phalangettian, common.	*Pedious, or short common extensor of the toes.*
7. Metatarso-inter-phalangian, superior.	*Superior interosseous.*

By bringing the articulations of the bones of the metatarsus closer to the first phalanges, in the form of an arch.

NEW NAMES.	OLD NAMES.
8. Transverse-metatarso-phalangian.	*Transverse of the toes.*

By bending the great toe.

9. Peroneo-sub-phalangettian of the great toe.	*Long flexor of the great toe.*
10. Tarso-sub-phalangian of the great toe.	*Short flexor of the great toe.*

By straightening the great toe.

11. Peroneo-super-phalangettian of the great toe.	*Extensor of the great toe.*

By bringing the great toe nearer to the rest.

12. Metatarso-sub-phalangian of the great toe.	*Adductor of the great toe.*

By removing the great toe from the rest.

13. Calcaneo-sub-phalangian of the great toe.	*Abductor of the great toe.*

By bending the little toe.

14. Tarso-sub-phalangian of the little toe.	*Short flexor of the little toe.*

By removing the little toe from the rest.

15. Calcaneo-sub-phalangian of the little toe.	*Abductor of the little toe.*

CEREBRAL

CEREBRAL AND NERVOUS SYSTEM.

237. *The cerebral and nervous ſyſtem in animals.* The cerebral and nervous ſyſtem in zoophytes, has the ſame appearance as the other parts; for the gelatinous and homogeneous conſiſtence of the ſubſtance of theſe animals prevents their different organs from being diſtinguiſhed. It cannot, however, be ſuppoſed that this ſyſtem is wanting in animals, which have the ſenſes of touching and ſmell exceedingly delicate, and which are ſenſible to the impreſſions of the light, heat, and moiſture: it is probable that it is equally diſſeminated throughout their whole ſubſtance; and as theſe animals can be divided into ſeveral parts, ſuſceptible of increaſe and life, this opinion ſeems thence to acquire a further degree of ſtrength.

The cerebral ſyſtem begins to be obſerved in worms, the nereids and amphinoma; it conſiſts of a long cord divided by knots; in the leech the knots are more perceptible, and appear to be ganglions. Theſe ganglions are very diſtinct in the aculeated aphrodite *(aphrodita aculeata)*, where they aſſume an arrangement which is found among inſects.

In the *molluſca acephala*, ſuch as the oyſter, the cerebral ſyſtem conſiſts of two ganglions united by two nervous cords.

In

In the gasteropoda, such as the snail and the slug, this system consists of a cerebral ring around the œsophagus, and a greater or less number of ganglions, scattered throughout the different organs. These parts have a communication with each other by means of a cord, and give birth to the nerves.

In the *mollusca cephalopoda*, such as the cuttle-fish *(sepia officinalis* and *sepia octopus)*, the cartilage of the head contains a peculiar cavity, in which is lodged the cerebral collar, and this cartilage is pierced with holes to afford a passage to the nerves.

Insects and the *crustacea* have a brain, consisting of two lobes, from which proceed nerves for the eyes, the antennæ and the mandibles: this brain then furnishes two nervous cords, which surround the œsophagus, and proceed to a series of ganglions, more or less numerous, united by a cord, and giving birth to the nerves which are distributed to the other parts.

238. *In vertebral animals*, the cerebral and nervous system is more complex; and notwithstanding the great variety of configuration which must occur among animals so different as fishes, reptiles, birds, and the mammalia, this system seems to be established in them all, according to a uniform plan. It always consists, 1st, of an organ contained in the cavity of the cranium

encephalon; 2d, of a *prolongation* lodged in the hole or cavity of the vertebral column: the *cerebral or rachidian prolongation*; 3d, of a nervous cord, or a feries of ganglions, united by a nervous cord, fituated interiorly on the fides of the vertebral column: *trifplanchnic.* Ganglions alfo are found in various parts. Nerves diftributed to all the organs proceed from thefe different fources.

239. *Encephalon.* The encephalic fyftem, and its prolongation, are inclofed in a double membrane; the exterior, which is thicker, is called the *meninx* or *dura mater:* the interior *(meningine)* confifts of two membranes, the exterior one of which is called the *arachnoid,* and the interior the *pia-mater.*

The *encephalon* always exhibits the two lobes of the brain, the layers of the ocular nerves, the cerebellum, and the commencement of the cerebral prolongation. Thefe parts are very different in the various claffes; but they almoft always give birth to twelve pairs of nerves which proceed from the cranium, to diftribute themfelves to the fame number of organs.

The firft pair proceed to the noftrils, by traverfing the os ethmoides. The *ethmoidal.*

The fecond pair to the eye, where they form the retina. The *ocular.*

The third pair to the mufcles of the eye. The *common oculo-mufcular.*

The

The fourth pair to the large oblique mufcle of the eye. The *interior oculo-mufcular.*

The fifth pair divide themfelves into three branches, which are diftributed to different parts of the face. The *trifacial.*

The fixth pair proceed to the right exterior mufcle of the eye. The *exterior oculo-mufcular.*

The feventh pair proceed to the face. The *facial.*

The eighth pair, to the labyrinth of the ear. The *labyrinthic.*

The ninth pair, to the pharynx and mufcles of the tongue. The *pharyngo-gloffian.*

The tenth pair, to the organs of refpiration and digeftion. The *pneumo-gaftric.*

The eleventh pair, to the tongue and its mufcles. The *hyo-gloffian.*

The twelfth pair arife from the *rachidian* prolongation, and afcend into the cavity of the cranium, from which they are diftributed to the cervical and dorfal regions. The *trachelo-dorfal.*

In fifhes, birds, and reptiles, the different parts of the encephalon are more or lefs diftinct and feparated; fo that thefe parts often touch each other only in one point: in the mammalia they approach each other, and are in fome meafure confounded.

In quadrupeds, the brain, which is flat and fhort, leaves the cerebellum uncovered behind. In

In apes it aſſumes more thickneſs, and is continued backwards on the cerebellum. This arrangement is more apparent in man.

In fiſhes, reptiles, and birds, the ſurface of the brain is ſmooth; in the *mammalia* it exhibits *circumvolutions.* In man and the dolphin theſe circumvolutions are numerous and deep: in apes and carnivorous animals they are leſs viſible, and in the *rodentia* ſcarcely appear.

In fiſhes, the encephalon is very ſmall; it occupies only a part of the cavity of the cranium, and is compoſed of a double ſeries of *tubercles*, united in a point. Two of theſe tubercles repreſent the *lobes* of the brain; two others form the ocular layers; that which conſtitutes the cerebellum is comparatively very large; in the laſt place, there is one which produces the commencement of the cerebral prolongation.

The encephalon of fiſhes has behind the cerebellum various other ſmall lobes, which give birth to ſome pairs of nerves, not found in the other claſſes.

The encephalon of reptiles varies greatly in the different genera of this claſs; but it is always formed of diſtinct tubercles for the lobes of the brain, the ocular layers, the cerebellum, and the cerebral prolongation.

In birds the encephalon conſiſts of ſix tubercles: two of theſe form the lobes of the brain;

two others the ocular layers: one conſtitutes the cerebellum, and the laſt the cerebral prolongation.

In the mammalia theſe parts approach each other, ſo that the lobes of the brain are almoſt united; the ocular layers are confounded with the brain; but the cerebellum remains diſtinct.

Each lobe of the brain has in the middle a cavity: *ventricle.* The ventricles of the brain aſſume various configurations, and the ſides of them have ſeveral prominences: that found in all vertebral animals is a protuberance marked with ſtriæ alternately gray and white in the inſide, among the mammalia; and with ſome whiter lines, in the other claſſes: *corpora ſtriata*, *ſtriated bodies.* Theſe bodies are very large in birds, and conſtitute almoſt alone the whole lobe of the brain.

The upper part of the lobes of the brain, which is continued with the ſtriated bodies, and forms the hemiſpheres, is thin in fiſhes, reptiles, and birds: in the mammalia it aſſumes more thickneſs, and in man its thickneſs is conſiderable.

Theſe ventricles have in the inſide alſo ſeveral prominences, which in different claſſes of animals are wanting, either in whole or in part; and which we ſhall examine minutely in man.

In fiſhes, reptiles, and birds, the layers of the ocular nerves are diſtinct, ſeparated, and exhibit

ventricles

ventricles in the infide: in the mammalia they are found in the fubftance of the lobes of the brain, and have no ventricles. Below and between the ocular layers is a *third ventricle.*

The cerebellum in all animals is a diftinct part: in fifhes it is round and very large; in birds it is flatted in a tranfverfe direction. In the mammalia there are two lateral lobes and a middle lobe. In man, the middle lobe, which is very fmall, is concealed by the other two.

In fifhes, reptiles, and birds, the furface of the cerebellum is fmooth; in all the mammalia it is marked with tranfverfe and parallel furrows. The cerebellum is united to the brain by two *tranfverfe peduncles*; and the latter proceed to two *longitudinal peduncles*, by means of which the brain is continued with its cerebral prolongation.

The commencement of the cerebral prolongation is generally marked by a diftinct tubercle, of a different form.

Between the cerebellum and the rachidian prolongation is a *fourth ventricle*, in which is always obferved a thin medullary lamina, called improperly a *valvula*.

All the ventricles have a communication with each other by foramina, the fides of which are contiguous.

In birds, the anterior ventricles are fhut on the interior fide by a thin and radiated partition.

The conduit which forms a communication be-

 tween

tween the third and fourth ventricle is called the *aqueduct of Silvius.* The ventricles of the ocular layers have a communication, by this aqueduct, with the other ventricles.

Before and behind the third ventricle is always found a tranſverſe cord: the two *commiſſuræ,* the *anterior* of which is generally longer and thinner, the *poſterior* larger and ſhorter.

Before the third ventricle is a funnel-like excavation, which is directed downwards, and continues with a tube that adheres to a tubercle. This tube and tubercle are diſtinguiſhed by the name of the *pituitary gland.*

In all vertebral animals is found a tubercle, called the *pineal gland.*

In the mammalia are obſerved ſome parts which are not found in the other claſſes.

In the bottom of the interval, which ſeparates the two lobes of the brain, is a large band, the extremities of which are folded downwards: *meſolobe.*

Below, is found a triangular protuberance, *arch with three pillars*: two of its angles are prolonged backwards and downwards; the third is formed of two cords, united, which proceed forwards and downwards. This trigone is continued inferiorly and anteriorly with a thin partition, called the *ſeptum lucidum.* This partition, which ſeparates the two ventricles of the brain, is formed of two

6 contiguous

contiguous laminæ; the triangular ſpace left between them is known by the name of the *fifth ventricle.*

In a part of the ventricles of the brain is found an elongated *protuberance*, which in quadrupeds is larger than in man, *cornua ammonis* (ram's horns).

Above the aqueduct of Silvius there are four tubercles (*tubercula quadrigemina*), which are alſo larger in quadrupeds than in man. The two anterior (*nates*), which are higher, are much larger in graminivorous than in carnivorous animals: on the other hand, the two poſterior (*teſtes*) are much more voluminous in the carnivorous than in the graminivorous.

Fiſhes and birds have alſo four tubercles; but they are placed before and above the ocular layers.

In apes and in man, the ventricles of the brain are continued backwards, with a cavity (*digitalis*) which lodges a protuberance (*the ſpur*).

240. *Cerebral or rachidian prolongation.* The cerebral prolongation gives birth to as many pairs of nerves as there are inter-vertebral ſpaces. Each rachidian nerve ariſes from two roots, ſeparated by a thin membrane; theſe two roots paſs through the meninx, and proceed to a ganglion which gives birth to two nervous branches.

 The

The rachidian or vertebral pairs are diſtinguiſhed into *cervical*, *dorſal*, *lumbar*, *pelvian*, and *caudal*; and are diſtributed to different parts of the trunk.

The laſt cervical and the firſt dorſal pairs unite to form a plexus, which furniſhes the nerves of the thoracic member. The laſt lumbar and the firſt pelvian form the plexus, which furniſhes the nerves of the pelvian member.

241. *Triſplanchnic.* All vertebral animals, on the ſides of the præſpinal face of their vertebral column, have a nervous cord in the ſame manner as fiſhes; or a ſeries of ganglions united by a nervous cord, in the ſame manner as the mammalia and birds. This ſyſtem has a communication, by filaments, with all the vertebral and with ſome of the encephalic pairs: it furniſhes branches which are diſtributed to the veſſels of the three large cavities.

242. *Cerebral and nervous ſyſtem of man.* In man, the cerebral and nervous ſyſtem is compoſed of the encephalic organ, the cerebral prolongation, the triſplanchnic, and various ganglions and nerves which proceed from theſe different parts.

Encephalon. The encephalic organ comprehends the brain, the cerebellum, the meſencephalon, and the commencement of the cerebral prolongation. It has the form of the cavity of the cranium

cranium in which it is contained; it is ſoft, and its gravity is to that of water as 1310 is to 1000. It forms the thirtieth part of the weight of the body in adults, the ſeventh or eighth part at the period of birth, and nearly one half of its total weight during the firſt months of conception. Its ſurface exhibits a number of deep ſinuous anfractuoſities over which the ſanguine veſſels are ſpread. The blood which arrives at this organ has been eſtimated at nearly the ſeventh or eighth part of that which iſſues from the aorta. The cerebral arteries are exceedingly flexuous, and their ſides are very thin: at the baſe of the cranium they form an anaſtomotic circle; they then expand over the whole ſurface of the brain, divide and ſubdivide themſelves into communicating branches, and terminate in very delicate ramifications, which penetrate into the ſubſtance of the brain, and in a great meaſure diſappear from the ſight.

The blood returns by veins without valves exceedingly flexuous, which preſent frequent anaſtomoſes, and do not follow the direction of the arteries; they form diſtinct branches, which, inſtead of uniting to conſtitute trunks, pour the blood obliquely, in the inverſe direction of its courſe, into ſinuſes or membranous ducts.

Though we do not know what takes place between theſe two orders of circulation; though the encephalic organ preſents itſelf under a pulpy and

 homo-

homogeneous appearance, and though microſcopic obſervation ſhows nothing in it but a collection of very fine globules, every thing announces the moſt perfect organization, and the moſt important ſecretion.

In the interior, the encephalic organ exhibits a ſtructure altogether peculiar; the ſides of the cavities are lined with a thin membrane; there are found alſo protuberances, ſmall bands, cords, ſtriæ of different forms, colours and denſities; holes, fiſſures and conduits, which have a communication with each other; and the whole of theſe forms, exceedingly numerous, exhibits a conſtant regularity.

In the laſt place, this encephalic organ and its rachidian prolongation are covered by a double membranous tunic, and encloſed in ſtrong oſſeous cavities; they give birth to numerous pairs of nerves, which proceed to every part of the body; theſe nerves divide themſelves into branches, which are ſubdivided into very delicate ramifications, that ſpread in all the organs, penetrate into every part of them, where they terminate in different ways, and carry thither the principle of action and of life.

As we are unacquainted with the particular uſe of the different parts which enter into the compoſition of the encephalic organ, the deſcription of them is merely graphic.

243. The

243. The double membrane which envelops this organ (*meninx* and *meningine*) form folds which are interpofed between its lobes.

The *meninx* (*dura mater*) is a thick, femi-tranfparent membrane, over which the meningian arteries are fpread: it lines the interior face of the cranium, to which it ferves as periofteum and ftrongly adheres to it, efpecially along its futures and at its bafe. Its interior face covers the meningine, without adhering to it.

The *meningine* (*pia mater*) confifts of two laminæ, clofely united; the interior of thefe laminæ furnifhes different folds, of which there are three principal ones. One of them extends from the ethmoidal ridge to the occipital protuberance, and forms a partition between the two lobes of the brain: *median feptum*; *falx of the brain.*

Another is placed below the pofterior part of the brain, which it feparates from the cerebellum; it extends from the occipital protuberance to the fuperior edge of the apophyfis petrofa; it is pierced before with a hole for the mefencephalon: *tranfverfe feptum of the cerebellum*; *tentorium of the cerebellum.*

A third extends from the occipital protuberance to the occipital hole, and feparates the two lobes of the cerebellum *: *median feptum of the cerebellum* (*falx of the cerebellum*).

The

* The meninx furnifhes alfo two folds, which extend from the

The meninx is prolonged through all the holes of the bafe of the cranium, and accompanies the parts which iffue from them. It furnifhes chiefly a *meningian fheath* to the *rachis:* this fheath adheres along the vertebral canal, envelops the rachidian prolongation, and furrounds the origin of the nerves which proceed from it.

The meninx in different parts of its thicknefs has different conduits, often of a triangular form (*finus*), which receive the blood of the veins, and pour it into the gulf of the jugular. Thefe finufes are very numerous: but there are reckoned to be four principal ones: one of them extends from the ethmoidal ridge to the occipital protuberance, along the upper edge of the median feptum of the brain: *median finus* (*fuperior longitudinal finus*). It there divides itfelf into two *lateral finufes* hollowed out in the thicknefs of the adhering edge of the tranfverfe feptum of the cerebellum, which extend as far as the occipito-petrean hiatus, and proceed to the jugular foffæ. Thefe finufes exhibit in the interior fome tranfverfe fræna, and a few fmall granulous bodies.

At the bafe of the median feptum of the brain, and near the tranfverfe feptum of the cerebellum, is a *choiridian finus* (*ftraight finus*), which tranfmits into the lateral finufes, the blood it receives from the choroidian veins, and from the *inferior*

the anterior clinoid apophyfes, to the pofterior, and two others which run along the fmall alæ of the fphenoid.

longitudinal

longitudinal ſinus. The latter proceeds along the median ſeptum of the cerebellum*.

The *meningine* is a thin tranſparent membrane, ſituated beneath the meninx, and which envelops the encephalicorgan and its prolongation; it is formed of two laminæ, between which are diſperſed a great number of veſſels.

The exterior lamina (*arachnoid*) covers the exterior face of that organ; it accompanies, to the place where they iſſue, the nerves which proceed from it; and then bends back on the interior face of the meninx, in the ſame manner as the ſerous membranes†. This lamina has ſeveral prolongations: one of them penetrates into the lateral ventricles, and covers the different prominences,

* The meninx forms alſo ſeveral ſmall ſinuſes, ſome of which run along the poſterior edge of the median ſeptum of the cerebellum. *Occipital ſinuſes*; others are placed along the upper edge of the petrous apophyſis: *ſuperior petrous ſinuſes.* Below the preceding, there are two others which extend along the articulation of the petrous apophyſis with the occipital: *Inferior petrous ſinuſes*: they empty themſelves directly into the gulf of the jugular.

A *ſinus* is ſituated tranſverſely on the baſiliar apophyſis, and communicates with the two preceding ones.

Two *cavernous ſinuſes* are lodged in the carotid canals, and open into the *petrous ſinuſes.* In the laſt place two *ſinuſes*, one before and the other behind the ſella turcica, communicate with the cavernous, and form a circle (coronary) around that part.

† See *Traité des Membranes*, du C. Bichat.

obſerved

obſerved in them. Another covers, with the meninx, the rachidian prolongation; accompanies to the place where they iſſue the nerves which proceed from it, and bends back on the interior face of the meninx. The interior lamina of the *meningine* (*pia mater*) produces prolongations which penetrate into all the anfractuoſities of the brain. It accompanies the meninx in its different paſſages, and produces along the vertebral canal indented expanſions, which are interpoſed between the anterior and poſterior bundles of the nerves of the rachis.

The ſurface of the brain exhibits numerous flexuous and deep anfractuoſities, and is divided longitudinally, at the ſummit, into two lobes, ſeparated by the median ſeptum. Each of theſe lobes may be divided inferiorly into three lobules. The firſt reſts on the orbitar arches; the ſecond is lodged in the temporal foſſæ; it is ſeparated from the firſt by a deep ſciſſure: the third reſts on the cerebellum, from which it is ſeparated by the tranſverſe partition of the meninx.

When the two lobes of the brain are ſeparated, there is ſeen a large white band, which unites theſe two bodies near their baſe. C. Chauſſier has given it the name of *meſolobe* *: (*corpus calloſum*).

The

* We ſhall proviſionally adopt the more rational language which C. Chauſſier has ſubſtituted for the whimſical and ridiculous

The ſuperior face of the meſolobe is covered by the ſharp edge of the longitudinal ſeptum, and by ſanguine veſſels; it exhibits in the middle a ſort of ſuture, and on the ſides tranſverſe ſtriæ.

The poſterior extremity of the meſolobe, which is broader than the anterior, forms a thick round roll. The meſolobe occupies nearly the middle half of the ſpace comprehended between the fore-head and the occiput; it is, however, nearer to the former. It continues on the ſides with the *white ſubſtance* (medullary) of the lobes of the brain. This part forms in the middle of the lobes an oval centre, ſurrounded by the gray ſubſtance (cortical).

Below the meſolobe are the two ventricles of the brain (lateral ventricles). Theſe cavities, the ſides of which are contiguous, deſcribe in their paſſage two oval furrows, interrupted before, placed back to back internally, and ſeparated from each other by a thin lamina: *median ſeptum of the ventricles*, (*ſeptum lucidum*).

Theſe furrows, taken towards their anterior and

lous names employed by the antients to denote the different parts of the encephalic organ. But, it muſt be confeſſed, that zootomy will never be in poſſeſſion of a nomenclature completely ſatisfactory, and ſuſceptible of being generally adopted, until intelligent anatomiſts employ themſelves, as the modern chemiſts have done, to reform the language of their ſcience; and until, after adopting *a method of nomenclature*, they ſhall have given to the different parts names ſuited not only to the organs of man, but alſo to the ſimilar or analogous parts in animals, ſo as to connect by language two branches of natural hiſtory, which ought never to be ſeparated.

interior

interior extrèmity, proceed backwards till they approach near to the poſterior lobes, where they are reflected outwards, and return in the thickneſs of the middle lobes, directing themſelves forwards and downwards.

The ventricles of the brain are broad at their entrance, and terminate in a point behind; in their paſſage they deſcribe the portion of a curve, the convexity of which is turned outwards.

The median ſeptum is formed of two very thin laminæ: theſe laminæ, which are not contiguous, leave between them a vacuity, in which a ſerous matter is ſometimes collected. *Ventricle of the ſeptum*, (*5th ventricle*).

The ſides of the ventricles of the brain have protuberances and cavities, which are fitted to each other, ſo as to leave no vacuity between them; they are lined with a very fine ſerous membrane, which is a continuation of the meningine, and which ſecretes a lymphatic dew; when this lymph is collected, it diſtends the ſides of the ventricles, and forms of them real cavities.

Along the baſe of the ventricles proceeds a membrano-vaſcular *plexus*, of a reddiſh colour, free and floating at the top, which adheres by its inferior face to the ſerous membrane that covers the ventricles. This body ſeems to be formed by the union of the arteries which proceed from the middle lobar, and the veins which convey the blood into the choroidian ſinus: *choroid plexus*.

 Below

Below the median ſeptum and the choroid plexus, and at the inferior ſide of the ventricles, is a body of a white ſubſtance, which has the form of a right-angled triangle, *cerebral trigone*, (arch with three pillars). The anterior angle terminates in two cords, which deſcend between the layers of the ocular nerves. The two poſterior angles turn backwards and outwards, and terminate in a point in the exterior and inferior part of the ventricles. The inferior face, which is ſlightly excavated, exhibits a triangular ſpace, on which are obſerved longitudinal ſtriæ in the form of a *lyre*.

On the ſides of the ventricles there are two broad, round eminences, which approach each other before, and terminate gradually in a point behind. The outſide of them is formed of a grayiſh ſubſtance, interſperſed in the interior with white ſtriæ, which proceed from a centre of the ſame colour, *pyriform eminences*, (ſtriated bodies).

Towards the middle of the ventricles of the brain, below and behind the pyriform eminences, are two whitiſh ovoid protuberances, covered by the choroid plexus, and the cerebral trigone, *layers of the ocular nerves*, (layers of the optic nerves). They are confounded on the outſide with the lobes of the brain; and the exterior part of them conſiſts of a white ſtratum, which mixes itſelf with the gray ſubſtance in the centre.

The pyriform eminences, and the layers of the ocular

ocular nerves, are ſeparated, on each ſide, by a furrow, which lodges a ſmall grayiſh ſemi-circular band. Theſe ſmall bands are thicker and nearer each other before than behind. *Small bands of the pyriform eminences*, (ſmall ſemicircular bands).

In that part of the ventricles, which is turned poſteriorly outwards and downwards, are two whitiſh, oblong, cylindric protuberances, thin and narrow behind: their anterior extremity, which correſponds to the termination of the ventricles, is broader and thicker, and exhibits three or four light tubercles, ſeparated by furrows: *cylyndroid protuberances*, cornua Ammonis, *ram's horns*.

On the interior ſide of the cylindroid protuberances, at the termination of the poſterior pillars of the trigone, is obſerved a grayiſh lamina, indented and free towards its exterior edge. The *bordered or fringed bodies*, (corpora fimbriata). The exterior ſide of theſe protuberances exhibits an eminence, broader behind than before, which correſponds to an anfractuoſity of the inferior part of the brain. The *acceſſories of the cylindroid protuberances*, (acceſſories of the cornua Ammonis).

Above and behind the cylindroid protuberances are two cavities, in the form of a bag, hollowed out in the ſubſtance of the poſterior lobes of the brain, *appendices of the ventricles*, (digital cavities). In theſe cavities is obſerved an *unciform eminence*, broad before, terminating in a point behind, and

bent

bent inwards, (*the ſpur*) which is formed by a prominence of a gray ſubſtance, covered by a white ſtratum.

The ſides of the ventricles are lined with a very fine ſerous membrane, overſpread with arteries and veins. The veins unite to thoſe which proceed from the choroid plexus, and form in each ventricle a *choroidian vein* (vein of Galen), which approaches that on the oppoſite ſide, between the layers of the ocular nerves. Theſe veins proceed backwards, and anaſtomoſe in a common ſhort trunk, which enters the anterior extremity of the right ſinus.

The layers of the ocular nerves leave between them an interval in the form of a fiſſure, *the third ventricle.* This interval is bounded at the top by the cerebral trigone, and at the bottom by the meſencephalon. The ocular layers are united at the bottom by a ſoft grayiſh tubercle; before this tubercle is obſerved an elongated aperture: *anterior aperture* (vulva); and behind a round aperture, *poſterior aperture* (anus): theſe apertures communicate with the lateral ſinuſes, and are covered ſuperiorly by the cerebral trigone. The lateral ſinuſes are bounded at the bottom by the meſencephalon.

Before the anterior aperture is a whitiſh cord, which extends profoundly, in a tranſverſe direction, into the ſubſtance of the middle ventricles

 of

of the brain, and turns in the form of a bow: *anterior commiſſura.*

Below the anterior commiſſura is a funnel-ſhaped excavation; the bottom of this excavation is continued with a ſolid grayiſh peduncle, which terminates at a round tubercle, reſting on the body of the os ſphenoides: *ſuperſphenoidal peduncle and appendix* (pituitary peduncle and gland).

Below and behind the poſterior aperture of the third ventricle is a ſecond whitiſh cord, larger and ſhorter than the anterior, which extends tranſverſely in the ſtrata of the ocular nerves: *poſterior commiſſura.*

Behind the poſterior commiſſura is a ſmall grayiſh conical body, of the ſize of a pea, ſoftiſh, and often containing gravel in the inſide: *the conarium* (pineal gland). The baſe of the conarium, which is turned forwards, ſeems to adhere to two very fine white cords, which paſs over the poſterior commiſſura, and are continued on the interior ſides of the ſtrata of the ocular nerves: *peduncles of the conarium* (the kidneys).

The conarium reſts above the four white tubercles: *tubercles of the meſencephalon* (tubercula quadrigemina). The two ſuperior and anterior of theſe tubercles, which are oval and larger (nates), are continued before with the poſterior commiſſura. The two inferior ones, which are round and ſmaller (teſtes), are continued with the ſuperior

ſuperior *prolongations* of the peduncles of the cerebellum, and with a whitiſh lamina, rounded at the top and covered with horizontal ſtriæ: *medullary lamina of the cerebellum* (valvula of Vieuſſens).

Below the poſterior commiſſura and the tubercles of the meſencephalon is a canal, which proceeds downwards: *intermediate canal of the ventricles* (aqueduct of Sylvius). It proceeds between the ſides of a fourth cavity: *fourth ventricle.*

This ventricle is ſituated below and between the peduncles of the cerebellum. It exhibits before, a longitudinal groove and two lateral ones, which terminate obliquely in a point on the firſt, and reſemble the cut part of a pen (calamus ſcriptorius). Behind, this ventricle is cloſed by the medullary lamina of the cerebellum; the baſe of it correſponds to the cerebral prolongation, and at its ſummit is found the aperture which conducts to the third ventricle.

The third and fourth ventricles contain a ſmall choroid plexus; their ſides are contiguous, and lined with a *ſerous membrane*, overſpread with ſanguine veſſels. This membrane continually pours forth a lymphatic dew, which is ſometimes found in a pretty large quantity, and which, in this caſe, diſtends the ſides of theſe cavities.

In the laſt place, the brain exhibits below and in the middle two large *peduncles* (prolongations

 of

of the brain, crura of the brain, crura of the medulla oblongata); theſe peduncles ariſe from the inferior part of the pyriform eminences. They ſeparate at their origin, and are placed behind the ſuperſphenoidal ſhank; they unite with thoſe of the cerebellum, and concur together to the formation of the meſencephalon. Before theſe peduncles, there are two round tubercles ſituated cloſe to each other, which reſult from the bifid termination of the anterior pillar of the trigone: *pyriform tubercles* (mammillary eminences).

244. The cerebellum is lodged in the occipital foſſæ, which determine its form: it is ſituated under the poſterior lobes of the brain, from which it is ſeparated by the *tranſverſe ſeptum*; its volume is nearly the eighth or ninth part of that of the cerebrum. It is divided poſteriorly, into two lobes, by a ſciſſure, which lodges the *median ſeptum*, and on its ſurface has deep tranſverſe furrows, which interſect each other at an acute angle.

The ſurface of the cerebellum exhibits alſo a pretty large number of mammillary protuberances; in general, there are five on the upper face, ten on the inferior, and two or three behind.

Between the lobes of the brain before is a protuberance, placed behind the quadrijumelli tubercles: *median protuberance of the cerebellum* (ſuperior vermicular eminence); at the bottom and in the middle

middle is found the *median lobule* (inferior vermicular eminence).

The number of laminæ produced by theſe anfractuoſities, is from 25 to 30 on each face. Between theſe laminæ are found others ſmaller and thinner.

The laminæ of the cerebellum are formed of a gray ſubſtance, and ramifications of a white ſubſtance; the white ramifications of ſeveral laminæ unite and form branches. Theſe branches proceed to a white nucleus, placed in the middle of each lobe of the cerebellum *(arbor vitæ)*.

The middle and anterior part of the cerebellum furniſhes two large cords or *peduncles*, which ariſe in the white centre of its two lobes. Theſe peduncles become larger, and each divides itſelf into three bundles: one aſcends before, and unites with the inferior tubercles of the meſencephalon; the other proceeds to the lateral parts of the bulb of the cerebral prolongation; the third, which is much larger, concurs towards the formation of the meſencephalon: *ſuperior, middle, and inferior prolongations of the cerebellum.*

The peduncles of the cerebellum are formed of a very white ſubſtance, which towards the centre contains a yellowiſh gray ſubſtance. They unite with the peduncles of the brain to form the *meſencephalon (annular protuberance—pons Varolii).*

245. The meſencephalon is found below the

 brain

brain and before the cerebellum; its ſuperior face, inclined backwards, correſponds to the third ventricle, and the intermediate canal of the ventricles; its inferior face, which is rounded, reſts on the baſillary eminence of the occipital bone. On its middle part is obſerved a longitudinal furrow or raphe, which lodges the trunk of the meſencephalic artery. Its anterior convex part is continued with the peduncles of the brain; its poſterior concave part correſponds on the ſides to the peduncles of the cerebellum; and in the middle gives birth to the cerebral prolongation. The exterior part of its ſubſtance conſiſts of white fibres, which loſe themſelves in the gray ſubſtance of the interior part. It exhibits tranſverſe or horizontal fibres, interſected at right angles by two bundles of a whitiſh ſubſtance; one on the right, the other on the left. Theſe bundles traverſe the meſencephalon, expand and proceed before to the pyriform bodies, and behind to the cerebral prolongation.

246. The commencement of the cerebral or rachidian prolongation is ſeparated from the meſencephalon by a tranſverſe furrow; its form is pyramidal and quadrilateral; its anterior face, inclined downwards, has in the middle a longitudinal furrow, on the ſides of which are obſerved the *pyramidal eminences*. Theſe eminences are ſeparated by a longitudinal furrow from two other *eminences* called the *Olivarian*.

The

The diameter of the *rachidian prolongation (medulla elongata)* is to that of the brain as 1 to 7; it has the form of the cavity which contains it. At its entrance into that cavity it is large, and decreafes towards the fourth cervical vertebra, but increafes towards the following ones. It then decreafes along the dorfal vertebræ, and again becomes larger towards the laft of that region. This prolongation terminates, towards the firft lumbar vertebra, in two tubercles, fituated before the other, and feparated by a groove: they give birth to a bundle of nerves which occupies the reft of the vertebral canal.

The cerebral prolongation is of a fofter confiftence than the brain; its fubftance is white, and in the infide has a grayifh furrow. It gives birth to thirty pair of nerves, which iffue through the vertebral holes.

247. Encephalic nerves. The brain, at its bafe, gives birth to twelve pair of nerves, which iffue through different holes of the bafe of the cranium.

248. The *firft pair* arife from the inferior and anterior part of the brain, by three filaments; two of which come from the interlobar fciffure; the third, interior, iffues before and below the pyriform eminences. Thefe filaments unite into a thick triangular cord, which foon becomes fmaller: this nerve advances under a furrow of

 the

the anterior lobe of the brain, and approaches that of the oppofite fide; it becomes larger and terminates on the fides of the ethmoidal ridge, in a round tubercle, exceedingly foft, femi-tranfparent and grayifh.

This tubercle gives birth to from 20 to 24 very delicate filaments, which traverfe the holes of the cribriform plate of the os ethmoides, defcend along very fmall canals, and proceed to the nafal foffæ. A part of thefe nervous filaments are diftributed within, on the feptum, and without, on the fuperior and middle cornets: they then become fo flender and pulpy, that they efcape the fight. ETHMOIDAL NERVE, *olfactory*. This nerve, in moft quadrupeds, is hollow.

249. *The fecond pair* arife from the pofterior and inferior of the ocular ftrata.

The cords of which they are compofed feparate by bending around the peduncles of the brain, and approach each other before the anterior commiffura; they then again feparate; proceed obliquely towards the ocular holes, and penetrate into the orbit enveloped in a fheath, furnifhed by the méninx.

The ocular nerve paffes between the tendons of the four ftraight mufcles; when it arrives behind the lobe of the eye, it pierces the fclerotica and the choroid, becoming fmaller, and then expands to form the retina: OCULAR NERVE, *optic*.

250. *The*

250. *The third pair* ariſe from an excavation found between the peduncles of the brain, near the meſencephalon, and iſſue in ſeveral filaments, which unite into a cord. This nervous cord diverges from that on the oppoſite ſide, advances behind the poſterior clinoid apophyſes, paſſes through the ſphenoidal fiſſure, and penetrates into the orbitar cavity, where it ſeparates into two branches: one of theſe, called the ſuperior, diſtributes itſelf by ſeveral filaments to the ſuperior ſtraight muſcle, and proceeds to the orbito-palpebralian; the other branch, which is larger, divides itſelf into three ſmaller branches: the firſt, or inferior, which is the largeſt, diſtributes itſelf to the interior ſtraight muſcle, paſſing under the ocular nerve; the ſecond, or exterior, which is longer, firſt furniſhes a ramus to the orbitar ganglion, and then diſtributes itſelf to the ſmall oblique muſcle; the third proceeds to the inferior right muſcle: COMMON OCULO-MUSCULAR, *common mover*.

251. *The fourth pair* ariſe by two or three ſmall filaments, cloſe to each other, between the peduncle of the cerebellum, and the inferior tubercles of the meſencephalon; turn round on the ſides of the meſencephalon; advance along the cavernous ſinus, in a canal formed by the meninx, and penetrate into the orbit by the ſphenoidal fiſſure. This nerve paſſes under the common oculo-

oculo-muſcular, proceeds towards the upper and interior ſide of the orbit, and diſtributes itſelf to the large oblique muſcle: INTERIOR OCULO-MUSCULAR, *pathetic.*

252. *The fifth pair* ariſe from the inferior and anterior part of the peduncles of the cerebellum, near the meſencephalon, in two portions: one, behind, conſiſts of about thirty filaments united; the other, before, which is ſmaller, conſiſts of ſeveral lax filaments. This nerve pierces the meninx towards the petrous apophyſis, and forms there a plexus, which gives three branches. THE TRIFACIAL, *the trigemini.*

Of theſe three branches one penetrates into the orbit by the ſphenoidal fiſſure: the *orbito-frontal*; the other proceeds to the face by the large round foramen; *the ſub-maxillary:* the third diſtributes itſelf to the lower jaw: *the maxillary.*

A. THE ORBITO-FRONTAL, *ophthalmic of Willis*, on entering the orbit divides itſelf into three rami.

a. One proceeds over the perioſteum of the arch of the orbit; iſſues through the ſuper-orbital foramen, and diſtributes itſelf to the eye-lid and the fore-head: *the palpebro-frontal* (frontal or ſupercilian). In its paſſage, it divides itſelf into two rami: the *interior ramus* ſends out a filament which unites to another of the naſal; it iſſues from the orbit above the cartilaginous pulley *(trochlea)*, and ſeparates into a great number of ſmall

ſmall branches, which are diſtributed to the fronto-ſupercilian muſcle, the occipito-frontian, the integuments, and the bulbs of the cilia.

The *exterior ramus*, which is larger, follows the direction of the muſcle that raiſes the eye-lid; iſſues through the ſuper-orbitar foramen, and divides itſelf into a great number of filaments, diſtributed to the eye-brows, the fore-head, and even to the ſummit of the head: a filament unites to a branch of the facial in the ſubſtance of the eye-lid.

b. The other ramus proceeds along the exterior ſide of the orbit, diſtributes itſelf to the lachrymal gland and the upper eye-lid: *lachrymal.* In its paſſage it throws out a filament which iſſues again through the ſpheno-maxillary fiſſure, and communicates with another of the ſuperior maxillary; a ſecond filament paſſes through a hole of the os jugale, and anaſtomoſes with another of the facial; the trunk then traverſes the gland, and loſes itſelf on the conjunctive membrane.

c. The laſt, the *naſo-palpebral* (naſal), throws out a filament on its entrance into the orbit: this filament unites to another which comes from the ſuperior cervical ganglion of the triſplanchnic, and both proceed to the *orbitar ganglion.* The naſo-palpebral nerve then proceeds towards the interior ſide of the orbit, and divides itſelf into two rami.

The firſt paſſes through the anterior orbitar hole,

hole, and penetrates into the cranium, traverſing the cribriform plate of the os ethmoides; it then re-enters the naſal foſſæ, by another hole of that bone; gives ſome filaments to the anterior ethmoidal and frontal cells; deſcends behind the bones of the noſe along their cartilages, and expands on the lobe of the noſe.

The ſecond proceeds towards the interior angle of the orbit, where it unites to a filament of the frontal; it then paſſes under the cartilaginous pulley of the great oblique muſcle, diſtributes itſelf to the neighbouring parts, and terminates at the eye-lids: *palpebral.*

The ORBITAR GANGLION, *ophthalmic* or *lenticular*, is very ſmall; it is found on the exterior ſide of the ocular nerve, near its entrance into the orbit. It receives the two filaments already mentioned and another very ſhort one tranſmitted to it by the common oculo-muſcular: there proceed from it ten or twelve filaments, which ſurround the optic nerve; traverſe the ſclerotica in different parts, creep over the choroid, and expand on the iris: *irian.*

B. THE SUPER-MAXILLARY, *ſuperior maxillary*, iſſues from the cranium, through the ſuperior maxillary foramen. On iſſuing from that hole, it throws out a ramus which penetrates into the orbit, by the ſpheno-maxillary fiſſure; *the orbitar*: it then proceeds towards the exterior ſide of that cavity, and divides itſelf into two filaments: one

of theſe unites to the filament of the lachrymal, which traverſes the os jugalis; the other pierces the orbitar portion of that bone, and penetrates into the temporal foſſa, where it unites with a filament of the inferior maxillary.

The ſuper-maxillary nerve penetrates into the ſummit of the zygomatic foſſa; and furniſhes two filaments, which proceed to the *ſphenoidal ganglion.* It throws out alſo ſeveral others which proceed behind the maxillary ſinus: ſome penetrate into the tuberoſity of that bone, and terminate in the dentar cavities of the laſt molar teeth (*poſterior dentary*), the reſt are diſtributed to the gums and the buccinator muſcle.

The ſuper-maxillary then enters the *ſuper-orbitar* canal, along which it gives out a ramus (*interior dentary*) that divides itſelf into ſeveral filaments. Theſe filaments pierce the alveolar edge, and diſtribute themſelves to the roots of the other teeth: one of theſe filaments communicates with another of the poſterior dentary.

The ſuper-maxillary nerve then iſſues through the ſub-orbitar foramen, and divides itſelf into a great number of rami, which have a communication with each other and with filaments of the facial; their aggregate forms a ſort of plexus, the ramifications of which are diſtributed to the muſcles of the noſe, the lips and the cheek.

The SPHENOIDAL GANGLION, *ſpheno-palatine*, is ſituated at the ſummit of the zygomatic foſſa; it

it receives, independently of the two filaments furniſhed to it by the ſuper-maxillary, a ramus formed by the union of a filament of the facial and another of the upper cervical ganglion.

The firſt filament (the ſuperior ramus of the *vidian*) iſſues from the *inflex* canal of the os temporis, through the *hiatus* of that bone, eſcapes from the cranium through the anterior foramen lacerum, and unites itſelf to the ſecond filament; the latter (the inferior branch of the vidian) ariſes from the ſuperior cervical ganglion of the great ſympathetic, aſcends along the carotid canal, and its union with the firſt produces the pterygoidian (vidian) nerve; this nerve traverſes the canal of the ſame name, and proceeds behind the *ſphenoidal ganglion.*

The ſphenoidal ganglion furniſhes ſeveral rami or filaments.

a. The largeſt of theſe proceeds towards the poſterior palatine canal, which it penetrates, after throwing out one or two filaments that paſs through the holes in the tuberoſity of the palatine bone; theſe filaments diſtribute themſelves to the guttural conduit of the ear, to the velum palati, and to the uvula. The *gutturo-palatine* (palatine). This large ramus then traverſes the poſterior palatine canal, and on iſſuing from it divides itſelf into ſeveral filaments, which are diſtributed on the palatine arch: *the ſuperior palatine.*

b. The other filaments, furniſhed by the ſphenoidal

noidal ganglion, arife from the interior part of it; penetrate into the nafal foffæ, through the fpheno-palatine foramen, and diftribute themfelves on the exterior fide of that cavity: The *ethmoidal* (fpheno-palatine). One of thefe filaments defcends in the infide on the partition of the nofe, to the bottom of the entrance of the noftrils, where it paffes into the anterior palatine foramen, unites to that on the oppofite fide, and forms a bulb or ganglion, which correfponds to the palatine arch behind the dentes incifores: *the nafo-palatine.*

c. The MAXILLARY, *inferior maxillary*, is the largeft branch of the trifacial: it iffues from the cranium by the inferior maxillary foramen, penetrates into the zygomatic foffa, and fends out a great number of rami, which form two bundles. The firft or fuperior one furnifhes:

a. A ramus which defcends below the exterior pterygoidian, paffes before the condyle of the jaw, and expands in the zygomato-maxillian mufcle: *the fub-zygomatic.*

b. Two filaments, which afcend in the temporal foffa, diftribute themfelves to the mufcle which covers it, and unite with a filament of the orbitar: *the temporo-mufcular.*

c. A ramus which defcends between the pterygo-maxillian mufcles, gives fome filaments to the fmall pterygo-maxillian, as well as to the temporo-maxillian; paffes behind the coronoid apophyfis of the

the jaw, expands into ſeveral filaments, in the bucco-labian muſcle, communicating with the facial and the ſub-orbitar: *the bucco-labian.*

d. In the laſt place a delicate and profound ramus which deſcends before, and diſtributes itſelf to the grand pterygo-maxillian muſcle: *the pterygo-muſcular.*

The ſecond or lower bundle furniſhes:

a. A ramus which deſcends behind the condyle of the jaw, ſends out a filament to the auditory conduit, and another which communicates with the facial at the place where it iſſues from the ſtylo-maſtoidian foramen. This ramus is then reflected before the ear, and divides itſelf into two filaments, which are diſtributed to the temporo-maxillian muſcle, accompanying the ſuper-facial temporal artery, and communicating with filaments of the facial: *the cutaneous temporal.*

b. A ramus which deſcends obliquely behind the ramus of the lower jaw, paſſes under the ſub-maxillary gland on the mylo-hyoidian muſcle, proceeds to the ſides of the tongue, and loſes itſelf at the point of it: *the lingual.*

In its paſſage, this ramus receives the tympanic ramus ariſing from the facial: it then throws out two or three filaments which form a plexus or ganglion, whence proceed other filaments which are diſtributed to the ſub-maxillary gland and ſurround the ſub-lingual artery: *the ſub-maxillary.*

In

In the laſt place, it furniſhes ſome filaments which are diſtributed to the ſub-lingual gland, and others which proceed to the membrane of the mouth, and communicate with filaments of the hyo-gloſſian muſcle.

The lingual then ſeparates into two rami; one of which ſends out filaments that proceed to the muſcles of the tongue; the other furniſhes ſome which are ramified on the ſides and at the tip of it, and which, by their termination, form the papillæ of that organ.

c. A third ramus, which ariſes from a trunk common to the preceding, *the maxillo-dentary*, deſcends behind the condyle of the jaw, and proceeds towards the maxillary canal. Before it enters this canal it gives out a filament which is diſtributed to the maxillary gland, the mylo- and genio-hyoidian muſcles (*the mylo-hyoidian*): this ramus then runs through the dentary canal, and in its paſſage ſends out filaments, which proceed to the dentary cavities of the large and of the firſt of the ſmall dentes molares (*dentary*). When it comes oppoſite to the hole of the chin it furniſhes a filament which follows the direction of the dentary canal, and is diſtributed to other teeth: it then iſſues through that hole, is reflected upwards, and divides into ſeveral filaments, which expand to the muſcles of the lower lip and the cheek.

253. The *ſixth pair* ariſe in ſeveral united fila-

 ments

ments from the furrow which ſeparates the meſencephalon from the cerebral prolongation. This nerve is flat, advances towards the point of the petrous apophyſis, and pierces the meninx to proceed into the cavernous ſinuſes, where it receives two filaments, which embrace the anterior cerebral artery: theſe filaments, which ariſe from the ſuperior cervical ganglion of the tri-ſplanchnic, form a plexus around that artery; it then penetrates into the orbit by the ſphenoidal fiſſure, and diſtributes itſelf to the exterior right muſcle of the eye. EXTERIOR OCULO-MUSCULAR, *exterior motor.*

254. The *ſeventh pair* ariſe from the triangular foſſet which is found between the meſencephalon and the exterior ſide of the baſe of the rachidian prolongation, near the olivarian eminence: it proceeds outwards with the labyrinthic nerve, then bends forwards and proceeds to the auditory foramen. This nerve ſoon ſeparates from the labyrinthic to penetrate into the ſpiroid canal of the temporal: it paſſes through its different windings and gives ſeveral rami, which are diſtributed to the face. THE FACIAL, *the hard portion of the ſeventh pair.*

a. One enters the cranium by the *hiatus* of the temporal bone, iſſues through the anterior foramen lacerum, and unites to a ramus which aſcends from the ſuperior cervical ganglion of the tri-

ſplanchnic

ſplanchnic by the carotidian canal: it then proceeds to the ſphenoidal ganglion: *the pterygoidian.*

b. Others very ſmall proceed to the muſcles of the ſmall bones of the tympanum.

c. A third, which is very delicate, penetrates into the tympanic cavity, paſſes between the incus and the malleus, applies itſelf to the membrane of the tympanum, iſſues from that cavity by the glenoidal ſciſſure, and forms a communication with the lingual nerve of the maxillary: *the tympanic:* (cord of the tympanum.)

d. The facial nerve iſſues from the ſpiroid canal by the ſtylo-maſtoidian foramen, and immediately produces ſeveral rami: one aſcends before the maſtoid apophyſis, and diſtributes itſelf behind the ear, *the poſterior auricular*; others deſcend below the ſterno-maſtoidian muſcle, and proceed to the trachelo-occipitian and the ſtylo-hyoidian muſcles: *the ſub-maſtoidian* and *ſtylo-hyoidian*: the former communicates with the pharyngo-gloſſian muſcle.

The facial nerve then deſcends in the ſubſtance of the parotid gland, where it divides itſelf into two branches.

e. The firſt proceeds upwards, paſſes before the articulation of the jaw, and divides itſelf into ſeveral rami, ſome of which are diſtributed on the temples: *the ſuper-orbitar.* Others are diſtributed below the eye and loſe themſelves in the orbicular

 and

and zygomato-labian mufcles: *the fub-orbitar:* the third proceed acrofs on the cheek, and expand into a great number of filaments on the mufcles of that part and on thofe of the lips, *the labial:* thefe rami are anaftomofed with the preceding and with an orbitar ramus of the maxillary.

f. The fecond branch defcends behind the angle of the jaw, and divides itfelf into feveral rami: fome proceed before the zygomato-maxillian mufcle, *the mentonniar*, and divide into a great number of filaments which are diftributed to the mufcles of the chin: they communicate with the filaments of the fuperior branch and rami of the buccal. Others defcend under the chin: *the fub-mentonniar*, and expand on the cutaneous mufcle into a great number of filaments, which communicate with fome arifing from the firft cervical pairs.

255. The *eighth pair* are placed behind the preceding, to which they are connected by fome filaments: the root of them is turned back on the pofterior edge of the median protuberance of the cerebellum: it is confounded behind with that of the oppofite fide.

This nerve accompanies the facial to the interior auditory foramen, which it abandons towards the orifice of the fpiroid canal, and penetrates into the veftibulum, where it divides itfelf into two branches: one proceeds forwards and expands in the form of a brufh in the ramps of the cochlea; the other proceeds

proceeds backwards and divides itſelf into three rami, which are diſtributed in the veſtibulum and in the interior of the ſemi-circular canals. THE LABYRINTHIC NERVE, *ſoft portion of the ſeventh pair.*

256. The *ninth pair* of nerves ariſe in three or four filaments, from the peduncle of the cerebral prolongation, near the olivarian eminence. This nerve iſſues from the cranium by the poſterior foramen lacerum, and immediately receives a filament from the facial, and another larger from the pneumo-gaſtric. It deſcends along the ſtylo-gloſſian muſcle, throws out filaments which follow the diviſions of the maxillo-facial artery, and which concur to the formation of the plexus ſurrounding the diviſions of that artery. This nerve gives out a great number of filaments, which diſtribute themſelves to the muſcles of the pharynx, and its interior membrane, *the pharyngian.* Some unite to others ariſing from the pneumo-gaſtric, the handle of the hyoidian and the tri-ſplanchnic, and form a plexus on the ſides of the pharynx.

The nerve of the *ninth pair* then deſcends between the ſtylo-pharyngian and ſtylo-gloſſian muſcles, gives filaments to them as well as to the tonſillæ, and is loſt by diſtributing itſelf to the muſcles which are at the root of the tongue. THE PHARYNGO-GLOSSIAN, GLOSSO-PHARYNGIAN, *branch of the eighth pair.*

 257. The

257. The *tenth pair* ariſe from the cerebral prolongation by ten or twelve filaments, which iſſue immediately behind thoſe of the preceding nerve. Theſe two nerves paſs together through the poſterior foramen lacerum, where they are ſeparated by a membranous production.

This nerve deſcends before the neck, and penetrates into the thorax, where it gives out rami to the lungs. It then iſſues from that cavity with the œſophagus, enters the abdomen, and diſtributes itſelf to the ſtomach and liver. THE PNEUMO-GASTRIC, *eighth pair, wandering pair.*

On its iſſuing from the cranium, this nerve furniſhes filaments which communicate with the pharyngo-gloſſian, the hyo-gloſſian, and the triſplanchnic; it then deſcends before the neck, and gives out a large ramus, which paſſes behind the anterior cerebral artery, and which proceeds to the larynx, where it divides itſelf into two rami: one of theſe is diſtributed to the muſcles of the pharynx and to the œſophagus; *the pharyngian:* the other, which is larger, penetrates into the larynx, enters the os hyoides and the thyroid cartilage, and divides itſelf into ſeveral filaments, which are diſtributed to the muſcles and the interior membrane of that organ: *the laryngian.*

The pneumo-gaſtric nerve then deſcends on the exterior ſide of the anterior cerebral artery; furniſhes one or two filaments to the cardiac plexus,

plexus, and penetrates into the breaſt. It paſſes before the ſub-claviar artery, and on the left before the aorta, where it gives a large recurrent ramus; *the tracheal.* This tracheal ramus proceeds inwards, is reflected on the ſub-claviar artery or aorta, and furniſhes ſeveral filaments to the cardiac plexus: it then aſcends again on the ſides of the tracheal artery, gives numerous filaments to it as well as to the œſophagus, *the œſophagian*; and at length reaches the larynx, into which it penetrates between the cricoid and the thyroid cartilages, where it terminates in ſeveral filaments, which are diſtributed to the muſcles of that organ, forming a communication with thoſe of the laryngian nerve.

This nerve furniſhes alſo a very great number of filaments, which concur to the formation of the pulmonary plexus.

The two pneumo-gaſtric nerves deſcend along the œſophagus, one before (that on the left) and the other behind (that on the right). They reciprocally throw out a great number of filaments, which form a plexus around that canal. When they reach the abdomen, the *one before* divides itſelf into ſeveral filaments, which follow the ſmall curvature of the ſtomach, and expand on its diaphragmatic face. Some of theſe filaments proceed to the liver, and concur towards the formation of the hepatic plexus. The *one behind* divides itſelf alſo into numerous filaments, ſome of which are

 diſtributed

diſtributed to the orifice of the œſophagus and the inferior face of the ſtomach: the reſt concur to the formation of the cœliac plexus.

258. The *eleventh pair* ariſe towards the middle of the furrow placed between the pyramidal and the olivarian eminences, and lower than the latter, in ſeparate filaments, which ſoon are collected into two or three bundles of a pyramidal form. Theſe bundles unite, and, iſſuing from the cranium through the anterior condyloid foramen, are diſtributed to the neck and the tongue. HYOGLOSSIAN, *ninth pair, great hypogloſſa, lingual.*

On iſſuing from the cranium, the hyogloſſian nerve accompanies the pneumo-gaſtric, the direction of which it ſoon croſſes. It receives a ramus of the ſub-occipital, at the height of the tranſverſe apophyſis of the atloid, and deſcends obliquely before the anterior cerebral artery.

Towards the middle of the neck this nerve gives out a branch which unites to one or two filaments of the ſub-occipital, and to filaments furniſhed by the ſecond, third, and ſometimes the fourth cervical pair. Theſe parts form together a reticulated arch of the *hyoidiam* nerves, the convexity of which turned downwards, gives birth to four or five twigs for the depreſſing muſcles of the os hyoides.

The trunk then throws out a branch to the hyo-thyroidian muſcle, *the hyo-thyroidian*; then paſſes between the mylo-hyoidian and hyo-gloſſian muſcles,

muſcles, and penetrates under the tongue, where it divides itſelf into ſeveral filaments: ſome of theſe communicate with the lingual nerve, and others are diſtributed to the muſcles of the tongue.

259. The *twelfth pair* ariſe, in ſeveral ſeparate filaments, from the ſides of the cerebral prolongation, towards the middle of the trachelian region. Theſe filaments aſcend along the rachidian canal, unite at a very acute angle, and form a common trunk, which iſſues through the poſterior foramen lacerum, on the exterior ſide of the pneumo-gaſtric nerve.

In its paſſage, or on its iſſuing from that hole, this nerve gives out or receives a ramus, which, united to ſeveral others of the pneumo-gaſtric, directs itſelf inwards on the anterior cerebral artery, furniſhes ſome filaments to the plexus which ſurrounds the diviſions of that artery, and expands on the ſides and in the top of the pharynx. This nerve deſcends before the tranſverſe apophyſis of the atloid; traverſes the ſterno-maſtoidian, after having furniſhed ſome filaments of communication to the firſt cervical pairs, and diſtributes itſelf to the dorſo-ſuper-acromian muſcle. THE TRACHELO-DORSAL, *the ſpinal or acceſſory of Willis.*

260. VERTEBRAL NERVES. Theſe nerves are in number thirty on each ſide, viz. eight in the

cervical

cervical region, twelve in the dorſal, five in the lumbar, and five in the ſacral.

Theſe nerves ariſe from the cerebral prolongation in a great number of filaments united into two bundles, the poſterior of which is larger than the anterior: both theſe proceed to a ganglion which gives out only one nervous trunk. This nerve ſoon divides itſelf into two branches, which iſſue through the vertebral holes, and proceed, the one behind and the other before.

261. *The cervical pairs.* The poſterior branches of all the cervical pairs, the firſt excepted, have a communication with each other, and paſs between the trachelo-occipitian muſcles and the tranſverſe of the neck. The two firſt are then reflected, and loſe themſelves in the teguments of the occiput, while the reſt are diſtributed to thoſe of the neck.

The anterior branches have alſo a communication with each other, and all preſent one or more filaments of communication with the triſplanchnic.

The firſt cervical pair ariſes between the occipital and the atloid; its anterior branch proceeds above the tranſverſe apophyſis of the atloid; ſurrounds it in part, and anaſtomoſes before it with a ramus ariſing from the anterior branch of the ſecond pair.

The poſterior branch, which is larger, directs itſelf

itſelf towards the triangular interval left between the atloido-occipitian, the atloido-ſub-maſtoidian, and the axoido-atloidian muſcles, where it diſtributes itſelf, and becomes loſt in the muſcles which cover the former.

The anterior branch of the ſecond pair ſubdivides itſelf into three rami, one of which unites with the anterior branch of the firſt pair, and concurs to form the nervous arch which is obſerved before the tranſverſe apophyſis of the atloid. From this arch ariſe filaments, which proceed to the triſplanchnic, the hyo-gloſſian and the pneumo-gaſtric. The ſecond ramus unites to a filament of the third pair, to form the nervous arch of the hyoidian nerves; the third, after giving out ſome filaments to the prædorſo-atloidian muſcles and the great-trachelo-occipitian, concurs to the formation of the *trachelo-cutaneous plexus.*

The anterior branch of the third pair ſends out a filament to the nervous arch of the hyoidian nerves; it then unites to the fourth, and concurs towards the formation of the ſame *plexus.*

The anterior branch of the fourth pair furniſhes, in general, a filament to the diaphragmatic nerve, and concurs alſo to the formation of that plexus.

The TRACHELO-CUTANEAN PLEXUS is ſituated on the ſides of the neck, at the height of the fourth cervical vertebra, and expands under the thoraco-facian. It is compoſed of two bundles of nerves,

nerves, one of which proceeds towards the head, and the other deſcends on the thorax.

The *firſt* divides itſelf into three branches, which aſcend, turning back on the poſterior edge of the ſterno-maſtoidian: *the cephalic.*

One of them gives out filaments to the thoraco-facian and the teguments of the anterior and ſuperior part of the neck: *the ſub-mentonniar.*

The other proceeds before the ear, and divides itſelf into ſeveral filaments, which are diſtributed to the parotid gland, the auditory conduit, and the neighbouring integuments. Theſe filaments communicate with the facial: *the zygomato-auricular.*

The third proceeds towards the maſtoid apophyſis, and divides itſelf into ſeveral filaments, which are diſtributed behind the ear and to the neighbouring integuments: *the occipito-auricular.*

The *ſecond* bundle of the trachelo-cutanean plexus, the *thoracic*, divides itſelf, like the firſt, into three branches.

One of theſe branches, which is often double, deſcends before the ſterno-maſtoidian, paſſes on the clavicle, and expands in the neighbouring integuments: *the ſternal.*

The other, which is larger, deſcends directly, and expands in the ſubſtance of the ſkin which ſurrounds the ſhoulder: *the acromian.*

The third is formed of ſeveral filaments, which deſcend deeply behind, and diſtribute themſelves

to

to the muſcles of the ſhoulder: theſe filaments communicate with the trachelo-dorſal: *the ſca-pulary.*

The anterior branch of the fifth pair gives out a filament to the *diaphragmatic* nerve; it then furniſhes ſeveral rami, which proceed backwards, ſend out ſome to the trachelo-ſcapulian, dorſo-ſcapulian, and dorſo-ſuper-acromian muſcles, and contribute to the formation of the *brachial plexus.*

The DIAPHRAGMATIC nerve is formed by filaments tranſmitted to it by the anterior branches of the fourth, fifth, and ſometimes the ſixth cervical pairs; it deſcends along the neck, gives out a filament to the triſplanchnic, and penetrates into the breaſt between the artery and the ſub-clavian vein. It runs over the ſides of the mediaſtinum, and reaches the diaphragm, on which it expands into ſeveral filaments.

The anterior branch of the ſixth cervical pair unites to that of the fifth, ſeventh, and eighth, and to the anterior branch of the firſt dorſal, and concurs towards the formation of the *brachial plexus.*

The BRACHIAL PLEXUS, ſituated on the inferior and lateral part of the neck, is formed of two bundles, a ſuperior and an inferior.

The ſuperior bundle reſults from the union of the three firſt pairs: the laſt two compoſe the firſt. Theſe two bundles approach and croſs each

other,

other, and paſs under the clavicle, embracing the ſub-claviar portion of the brachial artery. From this plexus then proceed nine diſtinct nerves or nervous bundles, which are diſtributed to the thoracic member.

262. NERVES OF THE THORACIC MEMBER. The firſt ariſes from the fifth trachelian pair, proceeds backwards, towards the ſuperior edge of the ſcapula, paſſes through the notch or hole obſerved in it, and ſends filaments to the ſuperior ſuper-ſcapulo-trochiterian muſcle; it then deſcends under the acromion, enters the ſub-ſpinal foſſa, and divides itſelf into ſeveral filaments, which proceed to the inferior ſuper-ſcapulo-trochiterian and the dorſo-ſuper-acromian muſcles: *the ſuper-ſcapulary.*

The ſecond, which are three in number, and ſometimes four, ariſe from the ſeventh and eighth pair.

One of them deſcends obliquely before, and diſtributes itſelf to the ſterno-humerian and coſto-coracoidian muſcles.

The other paſſes behind the axillary veſſels, and divides itſelf into ſeveral filaments, which proceed to the coſto-coracoidian muſcle, and the neighbouring integuments.

The third, which is longer, paſſes under the plexus, and, proceeding to the ſides of the thorax, divides itſelf into ſeveral filaments, which expand

on

on the coſto-ſcapulian muſcle: *the ſterno-thoracic* (*thoracic*).

The third, the principal ones of which are three in number, diſtribute themſelves in the following manner: one proceeds to the coſto-ſcapulian muſcle, another to the lumbo-humerian, and the ſub-ſcapulo-trochinian, and the laſt to the ſuper-ſcapulo-humerian and the inferior ſuper-ſcapulo-trochiterian: *the ſub-ſcapulary*.

The fourth iſſues from the poſterior part of the brachial plexus, and ariſes from the two laſt trachelian pairs and the firſt dorſal; it paſſes before the ſub-ſcapulo-trochinian, and gives ſome rami to it as well as to the ſcapulo-humerian: this nerve then turns round under the head of the humerus, and proceeds to the ſub-acromio-humerian: *the ſcapulo-humeral* (*axillary, circumflex*).

The fifth ariſes from the fifth and ſixth trachelian pairs, deſcends to the interior ſide of the arm, ſends out a filament to the coraco-humerian-muſcle, which it traverſes, and glides under the ſcapulo-radian, to which it furniſhes filaments as well as to the humero-cubitian. When it approaches the articulation it iſſues under the tendon of the ſcapulo-radian muſcle, deſcends along the radial edge of the fore-arm, ſending filaments to the teguments of that part, and terminates towards the thumb: *the radio-cutaneous* (*muſculo-cutaneous*).

The ſixth is the ſmalleſt of thoſe furniſhed by the

the plexus; it arifes from the laft trachelian pair and the firft dorfal. This nerve defcends along the interior part of the arm, and the fore-arm, to the little finger. In its paffage it firft fends out a ramus, which follows the direction of the fcapulo-radian mufcle, and diftributes itfelf to the palmary face of the fore-arm: when it approaches the articulation of the elbow, it fends out one or two rami, which pafs before the epitrochlea, are reflected, and diftribute themfelves on the fuper-palmary face of the fore-arm. This nerve then diftributes itfelf along the cubital edge of that part, as far as the little finger: *the cubito-cutaneous* (*interior cutaneous*).

The feventh is the largeft of the brachial plexus: it arifes from the laft three trachelian pairs. This nerve defcends obliquely behind, turning round the humerus; it then advances along the radial edge of the fore-arm, and terminates on the convexity of the hand: *the radio-digital* (*radial*).

This nerve defcends in the fubftance of the fcapulo-olecranian mufcle, and furnifhes three rami, which divide themfelves into filaments, and are diftributed to three portions of that mufcle.

Towards the middle of the humerus this nerve turns round; paffes between the humero-fuper-radian and the epitrochlo-metacarpian mufcles, and furnifhes a long cutaneous ramus, which proceeds

ceeds to the wrift, and along the fuper-palmar face of the fore-arm: it gives fome branches alfo to the epicondylo-radian and fuper-metacarpian.

Near the articulation of the elbow the radio-digital nerve gives out a large branch, which penetrates deeply; furnifhes filaments to the epicondylo-metacarpian and the epicondylo-radian mufcles, traverfes the latter, and is diftributed in feveral filaments to the mufcles of the fuper-palmar face of the fore-arm: one of thefe filaments paffes under the annular ligament, and expands on the carpus and the metacarpus. Having furnifhed this branch, the radio-digital nerve continues under the humero-fuper-radian mufcle along the radial edge of the fore-arm as far as its middle part, where it proceeds beneath the fkin, and divides itfelf into two rami: one of thefe defcends along the firft bone of the metacarpus, and feparates into two filaments, which are diftributed on the fides of the thumb and the radial face of the index finger. The other proceeds on the convexity of the hand, and divides itfelf into feveral filaments, which proceed to the cubital face of the index finger, the two fides of the middle finger, and the radial face of the ring finger.

The eighth arifes from the laft trachelian pair and the firft dorfal. It defcends on the interior fide of the arm, paffes behind the articulation of the elbow, continues along the cubital edge of

 the

the fore-arm, and terminates at the laſt fingers: *the cubito-digital* (*cubital*).

This nerve follows the interior edge of the ſcapulo-olecranian muſcle, gives ſome filaments to it near the articulation of the elbow, as well as to the neighbouring integuments; then paſſes between the olecranon and the epitrochlea, where it runs beneath the ſkin, and is reflected between the muſcles on the palmar face of the fore-arm. When it reaches the lower third of that part it ſends out a ramus, turns round on the back of the hand, and divides into two filaments, one for the little finger, the other for the ring finger and the middle finger.

The cubito-digital nerve iſſues from below the epitrochlo-carpian muſcle, paſſes before the annular ligament, advances towards the palm of the hand, and divides into two branches.

The firſt is ſuperficial, and divides itſelf into two rami, one of which proceeds to the cubital ſide of the little finger and to its muſcles; the other ſeparates into two filaments, which proceed on the correſponding ſides of the laſt two fingers.

The ſecond proceeds profoundly below the tendons of the common epitrochlo-phalanginian muſcle, and of the common cubito-phalangettian, and diſtributes itſelf, by a great number of filaments, to the metacarpo-ſuper-phalanginian muſcle and to the cubito-ſuper-metacarpian of the thumb.

The

The ninth arifes from the laft two trachelian pairs and the firft dorfal pair: it receives a ramus from the mufculo-cutaneous. This nerve defcends along the interior part of the arm, paffes before the articulation on the middle of the palmar face of the fore-arm, and is diftributed to the fingers: *the digital median* (*median*).

In its paffage along the arm, this nerve accompanies the humeral artery; paffes with it on the aponeurofis of the fcapulo-radian mufcle, near the articulation, and fends numerous rami to the mufcles of the fore-arm. One of thefe rami defcends before the inter-offeous ligament with the artery of the fame name; and, when it reaches the wrift, traverfes with it that ligament, and is reflected on the convexity of the hand.

After having furnifhed thefe rami, the digital median nerve traverfes the epitrochlo-radian mufcle, defcends profoundly along the fore-arm till towards the wrift, where it becomes fuperficial, and gives a ramus to the integuments of the palm of the hand. It then paffes under the annular ligament; becomes broader and divides itfelf into five rami, the firft of which is diftributed to the mufcles of the thumb, and the fecond to the radial fide of that finger. The third paffes between the firft and fecond bone of the metacarpus, gives a filament to the firft palmo-phalangian mufcle, proceeds to the radial fide of the index finger and

the cubital ſide of the thumb. The fourth paſſes between the ſecond and third bone of the metacarpus, gives a filament to the ſecond palmo-phalangian muſcle, and terminates on the correſponding faces of the index finger and middle finger. The fifth paſſes between the fourth and the fifth bone of the metacarpus, gives a filament to the third palmo-phalangian muſcle, and another of communication with the cubito-digital, and terminates by two filaments on the oppoſite faces of the ring and middle fingers.

263. *Dorſal pairs.* The twelve dorſal pairs ariſe, like the cervical, by two bundles, which unite to form a ganglion, whence two branches proceed.

The poſterior branches proceed between the tranſverſe apophyſes of the dorſal vertebræ, and give out rami to the muſcles of the back, which they traverſe to diſtribute themſelves to the integuments that cover them. The ſame diſpoſition prevails in regard to all the dorſal pairs.

The anterior branches, which are larger, paſs between the heads of the ribs, and communicate by two filaments with the thoracic ganglions of the large ſympathetic nerve.

Thoſe of the firſt ribs ſend filaments to the inter-coſtal muſcles, which they traverſe near the ſternum, and expand before the upper part of the thorax. Thoſe of the laſt, which are larger and more

more oblique, are diſtributed in the ſame manner to the inter-coſtal muſcles, which they traverſe to proceed to the integuments of the abdomen.

We ſhall here give a view of the peculiarities which the anterior or ſub-coſtal branch of each pair exhibits.

The firſt pair gives a large cord to the brachial plexus.

The ſecond paſſes under the ſecond rib; about its middle ſends out a ramus which iſſues from the thorax, and communicates with a filament of the brachial plexus, from which reſults a long, ſlender nerve, diſtributed along the cubital edge of the arm.

The third, in like manner as the preceding, furniſhes a ramus which is diſtributed to the integuments of the axilla: *cutaneous of the axilla.*

The fourth gives a ramus which divides itſelf into two filaments: one proceeds to the integuments of the anterior part of the thorax, and to the mammilla; the other proceeds towards the ſpinal part of the back.

The fifth and ſixth divide themſelves alſo in their middle into two rami, one of which is diſtributed to the lateral parts of the thorax, and the other proceeds towards the ſternum.

The ſeventh gives alſo two rami, one of which diſtributes itſelf to the integuments of the inferior part of the thorax; and the other expands in ſeve-

ral filaments to the inter-coſtian and ſterno-coſtian muſcles.

The ſub-coſtal branches of the eighth, ninth, tenth, and eleventh dorſal pairs divide themſelves alſo into two rami, the firſt of which is ſubdivided into two filaments. One of theſe is reflected on the ſides of the thorax; the other proceeds on the muſcles of the abdomen. The ſecond ramus is diſtributed alſo among the muſcles which form the ſides of the abdomen.

The twelfth communicates with the firſt lumbar pair; then ſends out ſome rami, which ſupply the diaphragm and the ilio-tranſverſian muſcle, and diſtribute themſelves, in ſeveral filaments, to the muſcles of the abdomen.

264. *Lumbar pairs.* The five pairs of lumbar nerves are furniſhed by the rachidian prolongation, in the ſame manner as the cervical and dorſal; their two bundles produce a ganglion, from which ariſes a trunk that divides itſelf into two branches.

The poſterior branches paſs between the tranſverſe apophyſes of the lumbar vertebræ, deſcend obliquely behind in the ſubſtance of the muſcles of that region, and proceed to the integuments of the nates and thighs.

The anterior branch of the firſt lumbar pair divides itſelf into three rami; one traverſes the præ-lumbo-trochantinian muſcle, proceeds towards the anterior angle of the hip-bone, and ſeparates into

ſeveral

ſeveral filaments, which are diſtributed to the muſcles of the abdomen, to the ſuperior and exterior part of the thigh, and towards the pubis (*ſuper-pubian*). The ſecond traverſes, in an oblique direction, the prælumbo-trochantinian muſcle and the iliac foſſa, below the peritoneum; proceeds towards the anterior angle of the hip-bone, glides between the muſcles of the abdomen, and loſes itſelf in the integuments of the groin (*inguino-cutaneous*). The third deſcends on the interior ſide of the other two; proceeds towards the crural arch, and divides itſelf into ſeveral filaments, ſome of which accompany the teſticular cord and proceed to the ſcrotum: the reſt paſs under the crural arch, are diſtributed to the integuments of the interior and ſuperior part of the thigh, and communicate with the *crural plexus*.

The anterior branch of the ſecond lumbar pair divides itſelf into two rami: one proceeds towards the crural arch, and terminates in ſeveral filaments, which diſtribute themſelves to the faſcia lata, and the integuments of the anterior part of the thigh; the other, which is larger, deſcends on the body of the ſecond lumbar vertebra, and unites to the third pair, to concur towards the formation of the *crural plexus*.

The anterior branches of the third, fourth, and

fifth lumbar pairs unite alſo for the formation of the ſame *plexus.*

265. *Sacral pairs.* The five ſacral pairs ariſe from the end of the cerebral prolongation. They are formed, like the other pairs, by two bundles, which unite to produce a ganglion, whence proceeds a trunk which divides itſelf into two branches.

The poſterior branches iſſue through the holes of the ſpinal face of the ſacrum, traverſe the ſacro-femorian muſcle, and terminate at the margin of the anus and a part of the nates.

The anterior branches, which are larger, iſſue through the holes of the pelvian face of the ſacrum, and by their union concur to the formation of the *hypogaſtric plexus* and the *crural plexus.*

The anterior branch of the fourth pair ſends alſo ſome rami to the iſchio-coccygian muſcle and to thoſe of the anus. That of the fifth, which is very ſmall, iſſues between the ſacrum and the coccyx, and diſtributes itſelf to the muſcles of the anus.

The HYPOGASTRIC PLEXUS is formed by ſeveral rami of the third ſacral pair, and a great part of the fourth, and communicates with filaments of the tri-ſplanchnic: it is ſituated on the ſides of the bladder, and furniſhes a great number of filaments, which are diſtributed to that organ, to the

proſtate

proſtate gland, to the rectum, and to the genital parts contained in the pelvis: *the pelvian*.

The CRURAL PLEXUS is formed by the laſt four lumbar pairs and the firſt four of the ſacral: it ſoon divides itſelf into two others, viz. the *lumbar* plexus and the *ſacral*. Theſe two plexus, each furniſh four diſtinct nerves, which are diſtributed to the pelvian limb.

266. NERVES OF THE PELVIAN LIMB. Of the four nerves furniſhed by the *lumbar plexus* to the pelvian limb:

The firſt traverſes the prælumbo-trochantinian muſcle, and the iliac foſſa, proceeds towards the anterior tubercle of the ilium, and diſtributes itſelf to the integuments of the ſuperior and exterior part of the thigh and haunch: *the exterior cutaneous*.

The ſecond is formed of from three to five filaments, which iſſue through the crural arch, and diſtribute themſelves to the integuments of the groin and the organs of generation, as well as to the interior and ſuperior part of the thigh: *the inguinal*.

The third, the largeſt of the nerves furniſhed by the crural plexus, is formed by the firſt four lumbar pairs: it is placed behind the prælumbo-trochantinian muſcle, which it traverſes obliquely, and iſſues from the abdomen by the crural arch, on the exterior ſide of the femoral artery.

This

This nerve divides itſelf in that place into a very great number of rami: the *ſuperficial* ones are diſtributed to the integuments of the anterior and interior part of the thigh, accompanying the ſaphene vein. Of the *profound* ones, ſome deſcend between the ilio-prætibian, the ilio-rotulian and the trifemoro-rotulian muſcles, and are ſubdivided into a great number of filaments, which diſtribute themſelves to theſe muſcles. The reſt accompany the crural artery, and proceed to the ſuper-pubio-femorian and the pubio-prætibian muſcles. One of theſe rami proceeds along the ilio-prætibian, and paſſes on the interior ſide of the knee: it then deſcends along the leg, *the tibio-cutaneous* (*ſaphene*); ſends out filaments to the anterior face of that part; accompanies the ſaphene vein, and terminates on the convexity of the foot: *femoro-prætibial* (*crural*).

The fourth ariſes, for the moſt part, from the ſecond, third, and fourth lumbar pairs; it deſcends along the interior edge of the prælumbo-trochantinian muſcle, penetrates into the leſſer pelvis, and iſſues from it by the ſub-pubian-hole; giving out a ramus to the ſub-pubio-trochanterian muſcles.

On iſſuing from the ſub-pubian hole, this nerve divides itſelf into two rami; the anterior one paſſes between the pubio-and ſub-pubio-femorian muſcles, and proceeds to the integuments of the anterior part of the thigh: the poſterior branch deſcends

descends between the sub-pubio- and the ischio-femorian muscles, and divides itself into a great number of filaments, which are lost in these muscles: *the sub-pubio-femoral*.

The *sacral plexus* furnishes the other four nerves of the pelvian limb.

The first arises from the third and fourth sacral pairs. It issues through the ischiatic notch, and distributes itself to the perinæum and the penis; *the ischio-penian*.

This nerve descends obliquely between the sacro-sciatic ligaments, and divides into two branches. The inferior one separates into a great number of filaments, which proceed to the muscles and integuments of the anus; to those of the perinæum, to the urethra, the scrotum and the dartos. The upper one proceeds towards the sciatic tuberosity, passes between the roots of the cavernous bodies, runs along the ascending branch of the ischium and the pubis; and, on its passage, throws out rami which are distributed to the interior sub-pubio-trochanterian muscle, the bulbo- and the ischio-cavernous, the ischio-perinæan, and the urethra. This branch then continues on the penis, where it is ramified, and furnishes filaments to the glans and præputium. In the female, this nerve, the *ischio-clitorian*, exhibits the same distribution: its inferior branch proceeds to the large labia, and the superior to the clitoris.

The

The ſecond is compoſed of two rami which iſſue from the pelvis through the iſchiatic notch, and diſtribute themſelves to the ſacro-femorian and ilio-trochanterian muſcles: *the feſſiers.*

The third ariſes from the ſecond and third ſacral pairs, and iſſues from the pelvis by the iſchiatic notch: *the ſmall femoro-poplitean.* It firſt furniſhes two or three rami which proceed to the muſcles ſurrounding the iſchium and the trochanter: *the iſchio-trochanterian*; it then deſcends between the large trochanter and the tuberoſity of the iſchium, and divides into two rami: the interior is reflected below the iſchium, and diſtributes itſelf inwards, about the upper part of the thigh, to the perinæum and the penis: *the cutaneous ſub-pelvian.* The exterior expands beneath the ſkin of the poſterior part of the thigh, and extends to the ham.

The fourth, which is the largeſt, diſtributes itſelf to the muſcles of the poſterior part of the thigh, the leg, and the foot: THE GREAT FEMORO-POPLITEAN. It ariſes from the laſt two lumbar pairs and the firſt three ſacral, and iſſues through the iſchiatic notch.

It firſt furniſhes rami to the muſcles which make the thigh turn outwards; it then paſſes between the great trochanter and the iſchium, and deſcends profoundly along the poſterior part of the femur, as far as the ham, where it becomes ſuperficial. In its paſſage it furniſhes ſeveral rami to the muſ-

cles

cles of the poſterior and interior part of the thigh. This nerve, when it reaches the ham, divides itſelf into two branches, which are diſtributed to the leg and the foot.

A. One of theſe branches, the PERONIAR, ſends out a ramus around the articulation of the knee: it furniſhes one or two alſo beneath the aponeuroſis which covers the calf of the leg, the *peroneo-cutaneous*, and ſeparates into two other rami, below the ſuperior extremity of the perone.

a. One, the *prætibio-digital*, deſcends between the peroneo-ſub-tarſian and the common peroneo-ſuper-phalangettian muſcles, and gives rami to all the muſcles which are before the leg: when it reaches the middle of that part it becomes ſuperficial, and divides itſelf into two branches. The *interior* proceeds obliquely towards the tibial edge of the foot; ſends ſome filaments to the integuments of that part, communicates with the tibio-cutaneous ramus of the femoro-prætibial, and ſeparates into two rami, one of which proceeds on the tibial ſide of the great toe; the other paſſes over the convexity of the foot, and diſtributes itſelf to the oppoſite faces of the firſt two toes. The *exterior* proceeds on the convexity of the foot, where it divides itſelf into three rami, one of which paſſes between the ſecond and third bone of the metatarſus, and divides into two filaments, which

which proceed to the oppoſite faces of the two correſponding toes. The ſecond deſcends, in like manner, between the third and fourth bones of the metatarſus, and diſtributes itſelf to the correſponding toes; the laſt follows the ſame direction between the laſt two toes.

b. The ſecond branch of the peroniar, the *præ-tibio-ſuper-plantaris*, paſſes between the tibio-ſuper-tarſian and the common peroneo-ſuper-phalangettian muſcles, and deſcends before the inter-oſſeous ligament, on the interior ſide of the tibial artery. In this paſſage it ſends filaments to ſeveral muſcles of the anterior part of the leg, and to the perioſteum. This branch then paſſes under the annular ligament, and divides itſelf into two rami, the exterior of which glides under the common calcaneo-ſuper-phalangettian muſcle and the laſt ſuperior metatarſo-inter-phalangian. The interior paſſes between the firſt and the ſecond bone of the metatarſus; ſends filaments to the firſt ſuperior metatarſo-inter-phalangian muſcle, and divides itſelf into two rami, which proceed to the oppoſite faces of the firſt two toes.

B. The ſecond branch of the great femoro-popliteal, the TIBIAL, which is larger, deſcends in the hollow part of the ham, on the popliteal veſſels, where it ſends out a very ſtrong ramus: *the peroneo-digital.*

This ramus deſcends behind the biſemoro-cal-canean

canean mufcle, and proceeds along the tibial edge of the calcanean tendon, accompanying the exterior faphene vein. It then paffes behind the exterior malleolus, fends filaments to the integuments of the heel; is reflected on the convexity of the foot, and proceeds between the fourth and fifth bones of the metatarfus to diftribute itfelf between the correfponding toes.

After fending out this ramus, the tibial nerve defcends between the bifemoro-calcanean mufcles, and furnifhes a great number of rami, which are diftributed to the articulation of the knee and the fuperior part of the mufcles that form the calf of the leg.

This nerve then paffes behind the malleolus of the tibia; gives fome filaments to the integuments of the heel; proceeds under the arch of the calcaneum, and divides itfelf into two rami.

The *interior* advances on the metatarfo-phalangian mufcle of the great toe; gives fome filaments to it, as well as to the common calcaneo-phalangettian, and divides itfelf into four filaments, the firft of which proceeds to the tibial edge of the large toe: the three others, each divide into two, and proceed on the faces comprehended between the firft four toes.

The *exterior* proceeds obliquely between the mufcles, towards the fifth bone of the metatarfus, and divides itfelf into two rami; one which is

ſuperficial ſubdivides, and a filament proceeds on the exterior edge of the little toe: the other proceeds between the two laſt toes. The *profound* ramus throws out ſeveral filaments, which are diſtributed to a part of the profound muſcles of the ſole of the foot.

267. TRI-SPLANCHNIC. Along the lateral and anterior parts of the bodies of the vertebræ, from the baſe of the cranium to the ſacrum, is a ſeries of ganglions united by a nerve which retains nearly the ſame ſize throughout.

Theſe ganglions, and the nerve which unites them, *receive* ſeveral filaments of the rachidian pairs, and communicate with ſome encephalic pairs: they *furniſh* numerous filaments which form plexus, and diſtribute themſelves to the veſſels and organs of the three large cavities: THE TRI-SPLANCHNIC, *great ſympathetic*, *inter-coſtal nerve*.

The firſt ganglion, the *ſuperior cervical*, is at the ſuperior part of the neck; it is ſituated before the tranſverſe apophyſis of the atloid, and behind the anterior cerebral artery: it is very large and elongated.

It *receives* ſeveral filaments of the pneumo-gaſtric, the hyo-gloſſian and the nervous arch, formed by the ſecond and ſometimes the third cervical pair.

It *furniſhes*, ſuperiorly, four filaments, which pe-

6 netrate

netrate through the inflex canal of the temporal, and which form a plexus around the anterior cerebral artery: one of these filaments proceeds to the *orbitar ganglion*, uniting itself to the naso-palpebral of the orbito-frontal; the second unites itself to the pterygoidian filament of the facial, and both concur to the formation of the *sphenoidal ganglion*: the two other filaments unite with the exterior oculo-muscular in its passage through the sinus cavernosus.

The superior cervical ganglion gives out, before, some filaments which unite with those forming the plexus that surrounds the divisions of the maxillo-facial artery. From its inferior part arises a filament, which concurs to the formation of the cardiac plexus. This ganglion continues with the portion of the tri-splanchnic which descends behind the anterior cerebral artery: it communicates, on the outside, with filaments of the fourth and fifth cervical pairs, and within sends out some filaments to the œsophagus, and one or more filaments to the cardiac plexus.

At the height of the fifth or sixth vertebra of the neck, the tri-splanchnic generally presents a small *ganglion* or *plexus, the middle cervical*. This ganglion or plexus communicates with a filament of the sixth cervical pair, and sends out a great number of filaments: some of these form a plexus around the thyroidian artery; others unite to those

thoſe which the ſuperior cervical ganglion furniſhes for the cardiac plexus: the laſt deſcend behind and before the ſub-claviar artery, which they embrace, and proceed to the *inferior cervical ganglion.*

The portion of the tri-ſplanchnic which unites the middle cervical ganglion to the inferior is very ſhort. The *inferior ganglion* is ſituated before the neck of the firſt rib; it is round, ſmaller than the ſuperior ganglion, and more voluminous than the middle one. It communicates with filaments of the laſt three cervical pairs, and of the firſt dorſal: it ſends out filaments which concur to the formation of the pulmonary plexus, and others which concur to that of the cardiac plexus.

The filament of the ſuperior cervical ganglion which unites itſelf to thoſe ariſing from the plexus of the cephalic artery, deſcends along that artery, and unites itſelf to ſome filaments of the tracheal and tri-ſplanchnic. This union produces a nerve which joins thoſe filaments ariſing from the middle cervical ganglion and the pneumo-gaſtric.

This nerve gives ſome filaments to the pericardium, and deſcends on the origin of the aorta, where it divides itſelf into a very great number of filaments: theſe filaments form a *plexus,* the laſt diſtributions of which loſe themſelves on the pulmonary ventricle, and the aortic auricle of the heart: *the anterior cardiac plexus.*

From

From the middle cervical ganglion, and particularly the inferior, as well as from the pneumo-gaſtric, proceed numerous filaments which deſcend before the tracheal artery, unite to ſome filaments of the left tracheal, ſurround the pulmonary artery, before which they form a *plexus (the pulmonary)*, and terminate on the right auricle and the aortic ventricle: *the poſterior cardiac plexus.*

From the inferior cervical ganglion, the tri-ſplanchnic penetrates into the thorax, and deſcends on the ſide of the bodies of the vertebræ, in the poſterior ſpace of the mediaſtinum.

In this paſſage, it exhibits ſmall ganglions, which correſpond between the heads of the ribs, and which *receive* two filaments from the dorſal pairs. It *gives* within, towards its ſuperior part, ſome filaments to the aorta; and from the fifth to the eleventh intercoſtal ſpace it ſends out five or ſix filaments. Theſe filaments unite to form the *great ſplanchnic*, which penetrates into the abdomen, between the pillars of the diaphragm, and proceeds to an aſſemblage of ganglions ſituated on the aorta, and the pillars of that muſcle: THE CŒLIAC GANGLION, *ſemi-lunar.*

The tri-ſplanchnic ſends out alſo, towards the eleventh and twelfth dorſal vertebræ, one or two filaments, which conſtitute the *ſmall ſplanchnic.* This nerve penetrates into the abdomen, and unites itſelf to others more numerous, ariſing

 from

from the ganglion and cœliac plexus. These nerves form a plexus on the artery of the kidneys, which they accompany in all their divisions: they give also some filaments to the capsular arteries, and others to the spermatic artery.

From the cœliac ganglion arise numerous rami of nerves, which proceed on the aorta, where they form a considerable plexus: THE CŒLIAC PLEXUS, *soleus*; at the top it furnishes filaments which accompany the inferior diaphragmatic artery: it sends out filaments which unite with those of the opposite side, and some of the pneumo-gastric, to form plexus, which surround on all sides the divisions of the opisto-gastric artery and the superior mesenteric: *the gastric plexus, hepatic, splenic*, and *superior mesenteric*.

These numerous filaments spread over the divisions of these arteries, embrace them, and accompany them in all their distributions.

The cœliac plexus furnishes a great number of filaments, which descend before the aorta, as far as the inferior mesenteric artery, where they unite to filaments of the lumbar portion of the trisplanchnic, and form around that artery a plexus, the numerous filaments of which accompany it in all its distributions: *the inferior mesenteric plexus*.

This cœliac plexus furnishes also filaments which unite with some arising from the fourth and fifth

fifth ſacral pairs, to concur towards the formation of the *hypogaſtric plexus.*

The tri-ſplanchnic, after ſending out filaments which form the great and ſmall ſplanchnic, penetrates into the abdomen, on the exterior ſide of the pillar of the diaphragm, deſcends on the ſide of the lumbar vertebræ, as far as the ſacrum, and exhibits ganglions, which correſpond to the intervals between the vertebræ.

In its paſſage it *receives* one or two filaments from the anterior branch of each lumbar pair, which proceed to its ganglions.

It *ſends out* filaments, before, to the inferior meſenteric plexus, and ſome to the other plexus furniſhed by the cœliac ganglion.

The tri-ſplanchnic then penetrates into the leſſer pelvis, and deſcends before the ſacrum, where it preſents ganglions as in its other parts: it *receives* two or three filaments from the anterior branches of the ſacral pairs.

It *furniſhes* very delicate filaments, which proceed to the hypogaſtric plexus, and others which are diſtributed to the rectum and to the neighbouring cellular tiſſue. It terminates either by being confounded with ſome ſacral pairs, or by uniting with that of the oppoſite ſide on the coccyx.

268. The cerebral organ, whether encephalic

 or

or rachidian, has the appearance of a pulpy and homogeneous ſubſtance. The great tenuity of its organic texture prevents its interior ſtructure from being known. This organ is incloſed in a double membranous covering (the meninx and meningine).

The nerves have the appearance of whitiſh cords, compoſed of fibres in *bundles*; theſe fibres are ſurrounded by a ſtratum of cellular tiſſue, which dividing them from each other, ſerves to unite them. This cellular tiſſue forms alſo a common covering around the nervous cords. Notwithſtanding this fibrous appearance, their compoſition ſeems to be analogous to that of the brain. Each fibre indeed of a nerve ſeems to be formed of a pulpy ſubſtance, contained in a membranous vagina or ſheath: the pulpy ſubſtance of the nerves continues with that of the cerebral organ, and their membranous ſheath (neurolemma) with the meningine.

Reil has proved this mode of ſtructure, by plunging the nerves either into dilute nitric acid, or into an alkaline ley (of potaſh or ſoda). In the firſt caſe, the nervous covering becomes diſſolved, and the pulpy ſubſtance remains concrete. In the ſecond caſe, the pulpy matter is diſſolved, and the membranous tube remains empty.

The nerves are diſtributed to the different parts by

by the mere ſeparation of their numerous ſmall fibres; it does not appear that theſe ſmall fibres ever divide themſelves into ramuſculi.

At their termination, the nerves ſeem to abandon their membranous covering, and to loſe themſelves in the ſubſtance of the different organs, by an expanſion of their pulpy ſubſtance.

Towards the cerebral organ, the nerves alſo leave their covering, which is continued with the meningine, and their pulpy ſubſtance is confounded with that of the brain, the meſencephalon, or rachidian prolongation.

Sœmering ſays, he traced the encephalic nerves, and particularly thoſe of the organs of the ſenſes, as far as the ſides of the ventricles of the brain; from which he concludes that the fluid contained in the interior of the ventricles muſt be conſidered as the centre of ſenſation.

From various chemical experiments made on the pulpy ſubſtance of the cerebral organ, it reſults, that this ſubſtance is almoſt entirely a ſort of albumen in a ſtate of ſemi-concretion.

TABLE OF THE CEREBRAL SYSTEM.

The cerebral system consists of the encephalic organ, the cerebral prolongation, the tri-ſplanchnic and ſome ganglions.

The encephalic organ comprehends the cerebrum, the cerebellum, the mesencephalon, and the commencement of the cerebral prolongation. It has the form of the cavity of the cranium in which it is contained; its surface exhibits numerous winding and deep anfractuosities, over which the sanguine vessels are spread; it is inclosed in a double covering; the exterior, which is very strong, is called

NEW NAMES.	OLD NAMES.
The meninx.	*Dura mater,*

and the interior, much thinner,

Meningine.	*Arachnoid.* *Pia mater.*

The meninx is formed of two laminæ closely united; the exterior adheres to the cranium, and serves it as a periosteum; the interior is prolonged between the divisions of the cerebrum, and forms different folds, of which there are three principal ones:

One of them is between the two lobes of the cerebrum:

Median-septum of the cerebrum.	*Falx of the cerebrum.*

The other is placed between the cerebrum and the cerebellum:

Transverse septum of the cerebellum.	*Tentorium of the cerebellum.*

The third is interposed between the two lobes of the cerebellum:

Median septum of the cerebellum.	*Falx of the cerebellum.*

The meninx is prolonged in the cerebral canal; adheres to its sides; serves them as a periosteum, and surrounds the vertebral nerves at their origin: it is reflected also into the different holes of the cranium, and confounded with the neighbouring periosteum.

The meninx exhibits, in different parts of its substance, *sinuses,* which receive the blood of the veins, and pour it into the jugular; of these sinuses, which are very numerous, there are four principal ones:

One

One of them runs along the superior edge of the median septum of the brain:

NEW NAMES.	OLD NAMES.
The median sinus.	*Superior longitudinal sinus.*

It is continued with

The lateral sinuses.	*The same.*

The third is at the base of the median septum of the brain:

Choiridian sinus.	*Straight sinus.*

And the fourth runs along the longitudinal septum of the cerebellum:

Inferior longitudinal sinus *.	*The same.*

The meningine is formed of two very thin laminæ, one of which envelops only the exterior surface of the encephalon:

The arachnoid.

The other is prolonged throughout all its anfractuosities:

Pia mater.

The encephalon is composed, in the interior part, of a *white* substance, covered by a thick stratum of a gray substance:

White substance.	*Medullary substance.*
Gray substance.	*Cortical substance.*

The brain is divided longitudinally, on the summit, into two lobes; and each of these is divided into three lobules: the *anterior*, *middle*, and *posterior*. The first two are divided inferiorly by a transverse scissure:

Inter-lobar scissure.	*Scissure of Sylvius.*

Between the lobes of the brain is found a broad white band:

Mesolobe.	*Corpus callosum.*

Below these are two ventricles, the sides of which are contiguous:

Ventricles of the brain.	*Lateral ventricles.*

They form two ovoid furrows, incomplete before, placed back to back within, and separated by a thin lamina:

Median septum of the ventricles.	*Septum lucidum.*

* The others are the occipital sinuses; the superior petrous sinuses; the inferior petrous sinuses; the transverse sinus; the cavernous sinus; the coronary sinuses.

This

This lamina is formed of two contiguous thin leaves, the separation of which can produce a triangular cavity:

NEW NAMES.	OLD NAMES.
Ventricle of the septum.	*Fifth ventricle.*

The ventricles of the brain communicate, behind, with another cavity, the sides of which are contiguous:

Appendix of the ventricles. . . . . *Digital cavities.*

Along the base of the ventricles of the brain runs a membranous, vascular, and reddish plexus.

Plexus choroides. . . . . . . *The same.*

Below the septum, at the base of the ventricles, is a part of a triangular form:

Cerebral trigone. . . . . . . *Fornix with three pillars.*

On the sides of the ventricles are two oblong grayish bodies, placed back to back:

Pyriform eminences. . . . . . *Striated bodies.*

Towards the middle of the ventricles of the brain, below and behind the pyriform eminences, are two whitish ovoid *protuberances*, united by a small, soft, and grayish cord:

Strata of the ocular nerves. . . . . *Strata of the optic nerves.*

The pyriform eminences, and the strata of the ocular nerves, are separated by a furrow, which lodges a small grayish band:

Small band of the pyriform eminences. . . *Small semi-circular band.*

In the exterior part of the ventricles of the brain there are two protuberances, of the form of these cavities:

Cylindroid protuberances. . . . . *Cornua Ammonis.*

On the interior side of these eminences is a grayish serrated lamina: . . . . *Fringed body.*

On the exterior side are two other protuberances:

Accessories of the cylindroid protuberances. . *Accessories of the cornua Ammonis.*

In the appendix of the lateral ventricles is observed

The unciform eminence. . . . . *The spur.*

Between the strata of the optic nerves is found the trunk of

The choroidian vein. . . . . . *Vein of Galen.*

The strata of the ocular nerves leave between them an interval in the form of a fissure:

Third ventricle. . . . . . . *The same.*

This

This ventricle contains a small choroid plexus; it presents before

NEW NAMES.	OLD NAMES.
Its anterior aperture.	*Vulva.*

It exhibits at the top and behind

Its posterior aperture.	*Anus.*

Before the anterior aperture is a long, whitish cord, which extends across it, in the form of an arc:

Anterior commissura.	*The same.*

Below this commissura is a funnel-formed excavation:

	Infundibulum.

The bottom of this excavation is continued with a grayish cord, adhering to a round tubercle, which rests on the body of the sphenoid:

Super-sphenoidal peduncle and appendix. . .	*Pituitary peduncle and gland.*

Below and behind the posterior aperture of the third ventricle is another thick and short transverse cord:

Posterior commissura.	*The same.*

Behind the posterior commissura is a small conical and grayish body:

Conarium.	*Pineal gland.*

It seems to adhere to two very fine cords, which pass over the posterior commissura, and proceed on the ocular strata:

Pedunculi of the conarium.	*Pedunculi of the pineal gland.*

The conarium rests on the mesencephalon, below four white tubercles:

Tubercles of the mesencephalon. . . .	*Tubercula quadrigemina.* *Testes et nates.*

The two inferior are continued with a whitish lamina, round at the top and striated:

Medullary lamina of the cerebellum. . . .	*Valvula of Vieusens.*

Below the posterior commissura is

The intermediate canal of the ventricles. . .	*Aqueduct of Sylvius.*

This canal proceeds to

The fourth ventricle, ...	*The same,*

which is situated between the pedunculi of the cerebellum and the cerebral prolongation.

This ventricle contains a small choroid plexus; it exhibits behind a lon-

a longitudinal and two lateral grooves, which terminate in a point on the former:

NEW NAMES.	OLD NAMES.
	Calamus scriptorius.

The contiguous sides of the ventricles of the brain are lined with a serous membrane, which is a continuation of the meningine; this membrane continually secretes a lymphatic moisture, which lubricates its surface. In the last place, the brain presents below, and in its middle,

Its two pedunculi.	*Prolongation of the brain, crura of the brain, arms of the medulla oblongata.*

Before the junction of the pedunculi are found

The pisiform tubercles.	*Mammillary eminences.*

The cerebellum presents on its surface mammillary eminences, and transverse and lamellar anfractuosities, which intersect each other at an acute angle. The centre of this organ is formed of a white substance, which is prolonged and ramified between the gray substance and its laminæ:

	Arbor vitæ.

Between the lobes of the cerebellum appears before,

The median protuberance.	*Superior vermicular eminence.*

Below and in the middle of it,

The median lobule.	*Inferior vermicular eminence.*

From the white centre of each lobe arise before,

The pedunculi of the cerebellum, . . .	*Prolongation of the cerebellum,*

which are divided into three bundles:

	Superior, middle, and inferior prolongations.

The pedunculi of the cerebellum unite to those of the brain to form

The mesencephalon.	*The annular protuberance. Pons Varolii.*

The mesencephalon is continued with the commencement of

The cerebral prolongation, ...	*Medulla oblongata,*

from which it is separated by a transverse furrow.

The commencement of the cerebral prolongation is of a pyramidal form; it exhibits before and in its middle a longitudinal furrow, on the sides of which are observed

The

NEW NAMES.	OLD NAMES.
The olivarian eminences.	*The same.*

Close to these eminences is another furrow, which separates them from

NEW NAMES.	OLD NAMES.
The pyramidal eminences.	*The same.*

The cerebral or rachidian prolongation has the form of the vertebral canal in which it is contained; it terminates towards the first lumbar vertebra in two tubercles, and a loose tufted nervous bundle:

NEW NAMES.	OLD NAMES.
Bundle of the lumbar and sacral nerves. . .	*Cauda equina.*

It exhibits before and behind a longitudinal groove; it is white, of a soft consistence, and in the middle has a grayish furrow.

The encephalon gives birth to twelve pairs of nerves, and the cerebral prolongation to thirty.

TABLE OF THE NERVES.

All the nerves originate from the encephalic organ, the rachidian prolongation, the tri-splanchnic, and some ganglions.

The encephalic organ gives birth, at its base, to twelve distinct pairs of nerves; the rachidian prolongation to thirty, and the tri-splanchnic to an indeterminate number.

ENCEPHALIC NERVES.

NERVE WHICH PROCEEDS ON THE SIDES OF THE NASAL CAVITIES.

I PAIR: arise by three filaments, two of which come from the interlobular scissure, and the third from the striated bodies:

NEW NAMES.	OLD NAMES.
Ethmoidal.	*Olfactory.*

NERVE WHICH PROCEEDS TO THE EYE, AND FORMS THE RETINA.

II PAIR: derive their origin from the posterior tubercles of the ocular strata:

Ocular.	*Optic.*

NERVES WHICH PROCEED INTO THE ORBIT,

Distributing themselves to almost all the muscles of the eye.

III PAIR: arise by several filaments from the excavation between the pedunculi of the brain, near the mesencephalon.

Common oculo-muscular.	*Common motor.*

Distributing themselves to the great oblique muscle of the eye.

IV PAIR: arise by two or three small filaments close to each other, between the pedunculi of the cerebellum, and the inferior tubercles of the mesencephalon.

Interior oculo-muscular.	*Pathetic.*

NERVE WHICH PROCEEDS TO THREE PARTS OF THE FACE.

V PAIR: it issues from before the pedunculi of the cerebellum, near the mesencephalon:

Trifacial.	*Trigemini.*

This

This nerve divides itself into three branches :

The first distributes itself to the eyes and the forehead,

NEW NAMES.	OLD NAMES.
A. Orbito-frontal.	*Ophthalmic of Willis.*

It divides itself into three rami :

1. The palpebro-frontal,	*Frontal or supercilliar,*

which gives a *palpebralian* ramus, that expands in ciliar ramusculi :

2. The lachrymal.	*The same.*
3. The naso-palpebral.	*Nasal.*

The latter gives a filament to the orbitar ganglion—a ramus to the *nasal—ethmoidal* filaments—*naso-lobar* filaments—a *palpebral* ramus.

GANGLION SITUATED NEAR THE INSERTION OF THE OCULAR NERVE INTO THE EYE.

Orbitar ganglion.	*Ophthalmic or lenticular ganglion.*

It receives

A filament from the naso-palpebral—a filament from the superior cervical ganglion—a filament from the common oculo-muscular.

It furnishes

Ten or twelve filaments which proceed to the eye, and distribute themselves behind the iris :

The irian.	*The ciliar.*

The second ramus of the trifacial distributes itself to the middle part of the face :

B. The super-maxillary.	*Superior maxillary.*

It gives,

First, An orbitar ramus, from which proceeds a jugal and a temporal filament; second, one or two filaments to the sphenoidal ganglion; third, anterior and posterior dentar filaments; fourth, the sub-orbitar nerve.

GANGLION SITUATED AT THE SUMMIT OF THE ZYGOMATIC FOSSA :

Sphenoidal ganglion.	*Spheno-palatine ganglion.*

It receives	*It gives*
Two filaments from the super-maxillary, a ramus formed by a pterygoidian filament of the tri-splanchnic, and a pterygoidian ramus of the facial.	*Two filaments of the superior maxillary, the pterygoidian or vidian branch.*

It

It gives

Nerves which proceed to the guttural region of the pharynx and to the palate:

NEW NAMES.	OLD NAMES.
The gutturo-palatine.	*Palatine.*
The superior palatine.	

To the nasal fossæ:

The ethmoidal.	*Spheno-palatine.*
Naso-palatine.	*The same.*

The third branch of the trifacial distributes itself to the inferior jaw:

C. The maxillary.	*Inferior maxillary.*

It gives two bundles:

The superior one furnishes

1st, The sub-zygomatic; 2d, the temporo muscular; 3d, the bucco-labial; 4th, the pterygo-muscular.	*1st, The masseterin; 2d, the temporo-profound; 3d, the buccal; 4th, the pterygoidian.*

The inferior gives

1st, The cutaneous temporal; 2d, the lingual, from which proceed the sub-maxillary; 3d, the maxillo-dentar, from which proceed the mylo-hyoidian and the dentary.	*1st, The superficial temporal; 2d, the lingual; 3d, the inferior dentary.*

NERVE WHICH PROCEEDS INTO THE ORBIT,

And distributes itself to the interior right muscle.

VI PAIR: it arises between the mesencephalon and the cerebral prolongation, in several filaments united:

Exterior oculo-muscular.	*Exterior motor.*

It receives

Two filaments, which united to two others of the superior cervical ganglion, form a plexus around the divisions of the anterior cerebral artery.

NERVE WHICH DISTRIBUTES ITSELF TO THE FACE,

Passing through the spiroid canal of the temporal bone.

VII PAIR: it issues from the triangular facet which is found between the mesencephalon and the exterior side of the base of the rachidian prolongation:

The facial.	*Hard portion of the seventh pair.*

It

It gives

NEW NAMES.	OLD NAMES.
1st, A pterygoidian filament; 2d, filaments to the small bones of the tympanum; 3d, a tympanic ramus, posterior auricular filaments, a sub-mastoidian ramus, a stylo-hyoidian ramus, super-orbitar, labial, mentonniar and sub-mentonniar rami.	*1st, Superior ramus of the vidian;* *2d, The same;* *3d, Cord of the tympanum; temporal, molar and buccal rami.*

NERVE WHICH PROCEEDS INTO THE EAR,

Distributing itself in the labyrinth:

VIII Pair: it arises from the sides of the fourth ventricle, behind the seventh pair, with which it is connected by some filaments:

The labyrinthic. . . . . *Soft part of the seventh pair.*

NERVE WHICH PROCEEDS TO THE TONGUE,

Distributing itself to the pharynx, and to the muscles at the root of the tongue:

IX Pair: it originates in three or four filaments from the pedunculus of the rachidian prolongation, near the olivarian eminence:

The pharyngo-glossian. . . . . . *The glosso-pharyngian or branch of the eighth pair.*

It gives

The pharyngians. . . . . . .

NERVE WHICH PROCEEDS TO THE LUNGS AND THE STOMACH,

Distributing itself along the neck, in the thorax and abdomen:

X Pair: it comes from the base of the rachidian prolongation, in ten or twelve filaments:

The pneumo-gastric. . . . . . . *Eighth pair or par vagum.*

It furnishes

On the neck, pharyngian rami, a laryngian ramus, filaments to the cardiac plexus, a tracheal ramus. *The recurrent.*
To the thorax, filaments for the pulmonary plexus;
In the abdomen, rami to the stomach. . . *The stomachic anterior and posterior.*

NERVE WHICH PROCEEDS TO THE NECK AND THE TONGUE,

Distributing itself to the muscles of the tongue, and to the greater part of those attached to the os hyoides:

XI Pair: it arises towards the middle of the furrow placed between the pyramidal and olivarian eminences:

Hyo-glossian. . . . . *Ninth pair, great hypoglossus, lingual.*

It furnishes

A branch for the plexuous arch of the hyoidians—a hyo-thyroidian ramus—filaments to the muscles of the tongue.

NERVE WHICH DISTRIBUTES ITSELF TO THE STERNO-MASTOIDIAN AND THE DORSO-SUPER-ACROMIAN:

XII PAIR: it arises towards tbe middle of the trachelian region, and the sides of the rachidian prolongation, by several distinct filaments, which unite into one trunk: this trunk enters into the cranium through the occipital hole, and issues through the posterior foramen lacerum:

NEW NAMES.	OLD NAMES.
Trachelo-dorsal.	*Spinal, accessory of Willis.*

VERTEBRAL NERVES.

These arise from the cerebral prolongation, by a great number of filaments, united into two bundles, the posterior of which is larger than the anterior; both proceed to a ganglion, from which one trunk of nerves then issues; this nerve soon divides itself into two branches, which issue through the foramina of the rachis. The posterior branches proceed to the spinal face of the rachis, and distribute themselves to the muscles and the neighbouring integuments. The anterior branches, soon after they issue from the vertebral foramina, unite with each other by filaments of communication, and all of them send one or more filaments to the trisplanchnic.

NERVES WHICH PROCEED TO THE NECK.

The eight cervical pairs,

Distributing themselves to the muscles and the integuments of the spinal face of the neck:

The posterior branches.

Which distribute themselves behind the head and the neck:

The anterior branches.

These furnish

1st, The nerves which form the trachelo-cutaneous plexus, and which are: the branches of the second, third, and fourth cervical pairs.

This

This plexus furnishes, 1st, mentonniar, zygomato-auricular, and occipito-auricular branches; 2d, sternal, acromian and scapular branches.

2d, The rami which form the diaphragmatic nerve, and which are: the anterior branches of the fourth, fifth, and sometimes the sixth cervical pairs.

3d, The nerves which form the *brachial plexus*, and which are: the anterior branches of the last four cervical pairs, and of the first lumbar.

The nerves which proceed to the thoracic member arise from

NEW NAMES.	OLD NAMES.
The brachial plexus.	*The same.*

This plexus divides itself into nine branches or bundles.

1ST. NERVE WHICH PROCEEDS TO THE SHOULDER,

Distributing itself to the super-scapulo-trochiterian, and dorso-super-acromian muscles:

The super-scapular.	*The same.*

2D. NERVES WHICH PROCEED TO THE STERNAL FACE OF THE THORAX,

Distributing themselves in three filaments: 1st, to the sterno-humerian; 2d, to the costo-coracoidian; 3d, on the side of the thorax:

The sterno-thoracic.	*Thoracic.*

3D. NERVES WHICH PROCEED TO THE SHOULDER AND THE ARM,

Distributing themselves by three filaments: 1st, to the costo-scapulian; 2d, to the lumbo-humerian and the sub-scapulo-trochinian; 3d, to the scapulo-humerian, and the inferior super-scapulo-trochiterian muscles:

The sub-scapular.	*The same.*

4TH. NERVE WHICH PROCEEDS AROUND THE SCAPULAR ARTICULATION OF THE HUMERUS,

Distributing itself: 1st, to the sub-scapulo-trochinian muscle; 2d, to the sub-acromio-humerian; 3d, to the radial edge of the arm:

The scapulo-humerian.	*Axillary or circumflex.*

5TH. NERVE WHICH PROCEEDS TO THE ARM AND FORE-ARM,

Distributing itself superficially to the interior side of the arm, along the radial edge of the fore-arm as far as the thumb:

The radio-cutaneous.	*Musculo-cutaneous.*

6TH. NERVE WHICH PROCEEDS TO THE ARM AND FORE-ARM,

Distributing itself superficially along the cubital edge of the arm and fore-arm, as far as the little finger:

NEW NAMES.	OLD NAMES.
The cubito-cutaneous.	*Interior cutaneous.*

7TH. NERVE WHICH PROCEEDS TO THE ARM, THE FORE-ARM, AND HAND,

Distributing itself around the humerus, behind, along the radial edge of the fore-arm, on the convexity of the hand, and to the first three fingers:

The radio-digital.	*Radial.*

8TH. NERVE WHICH PROCEEDS TO THE ARM, THE FORE-ARM, AND THE HAND,

Distributing itself to the interior side of the arm, behind the articulation of the elbow; along the cubital edge of the fore-arm, and to the two last fingers:

The cubito-digital.	*Cubital.*

9TH. NERVE WHICH PROCEEDS TO THE ARM, THE FORE-ARM, AND THE HAND,

Distributing itself to the interior of the arm, before the articulation of the elbow; on the middle of the palmar face of the fore-arm, and to the fingers:

Digital median.	*Median.*

NERVES WHICH PROCEED TO THE DORSAL REGION, AND TO THE SIDES OF THE THORAX AND ABDOMEN:

The twelve dorsal pairs.

Which distribute themselves to the integuments of the back:

The posterior branches.

Which pass between the ribs, and distribute themselves before the thorax, to the muscles and integuments of the abdomen:

The anterior branches.

NERVES WHICH PROCEED TO THE LUMBAR REGION, TO THE SIDES OF THE ABDOMEN, AND INTO THE PELVIS:

The five lumbar pairs.

Which distribute themselves to the muscles of the lumbar region and to the integuments of the nates:

The posterior branches.

Which

Which distribute themselves to the sides of the abdomen and the pelvis, and furnish some to the crural plexus :

The anterior branches.

NERVE WHICH TRAVERSES THE PELVIS, AND PROCEEDS TO THE REGION OF THE GROIN :

The anterior branch of the first lumbar pair.

It gives,

1st, A ramus which proceeds to the muscles of the abdomen and to the pubis, *sub-pubian ;* 2d, a ramus to the integuments of the groin; 3d, a ramus which follows the contour of the ridge of the ilium, and proceeds to the scrotum, along the testicular cord.

NERVES WHICH ISSUE FROM THE OS SACRUM:

The five sacral pairs.

Which distribute themselves to the nates and to the anus :

The posterior branches.

Which supply the hypogastric and crural plexus, and distribute themselves to the coccyx and anus :

The anterior branches.

NERVES WHICH FORM THE HYPOGASTRIC PLEXUS:

The anterior branches of the fourth and fifth sacral pairs, and filaments of the tri-splanchnic.

They furnish

The pelvian, which are distributed to the bladder, the rectum, and the genital parts contained in the pelvis.

NERVES WHICH FORM THE CRURAL PLEXUS:

The anterior branches of the last four lumbar pairs, and of the first four sacral.

The nerves distributed to the pelvian membèrs arise from the crural plexus, which divides itself into two other plexus: 1st, the lumbar plexus; 2d, the sacral plexus: they each furnish four principal branches to the pelvian member.

NERVES ARISING FROM THE LUMBAR PLEXUS:

1st, Nerve which proceeds to the thigh,

Passing near the anterior tubercle of the ilium, and sending out ramifications to the exterior part of the thigh and the leg :

NEW NAMES.	OLD NAMES.
The interior cutaneous.	*Crural.*

2d. Nerves which distribute themselves in three, four, or five filaments to the glands, the integuments of the groin, and to the genital parts :

The inguinal.	*Crural.*

3d. Nerve which proceeds to the thigh, the leg, and the foot,

Descending behind the prælumbo-trochantinian muscle, passing through the crural arch, and distributing itself to the integuments of the anterior part of the thigh, and by a long ramus (tibio-cutaneous) *to the muscles and integuments of the leg and the foot :*

The femoro-prætibial.	*Crural.*

4th. Nerve which proceeds to the interior part of the thigh,

Passing through the sub-pubian hole, and distributing itself to the muscles and integuments of the anterior and interior part of the thigh :

The sub-pubio-femoral.	*Obturator.*

NERVES ARISING FROM THE SACRAL PLEXUS:

1st. Nerve which proceeds to the penis and the clitoris,

Passing through the ischiatic notch, and distributing itself to the perinæum, to the penis, and the clitoris ;

Ischio-penian, ischio-clitorian.	*Pudical.*

2d. Nerve which proceeds to the nates,

Distributing itself to the sacro-femoral muscle, the ilio-trochanterian muscles, and to the integuments of the thigh ;

The fessiers.	

3d. Nerve which proceeds to the posterior part of the thigh,

Giving, 1st, two or three ischio-trochanterian rami to the muscles situated in the neighbourhood of the ischium and the trochanter ; 2d, the cutaneous sub-pelvian, which proceeds to the integuments of the sub-pelvian region and the interior part of the thigh ; 3d, the posterior cutaneous of the thigh, a long ramus which is distributed

buted to the integuments of the popliteal face of the thigh, and extends as far as the ham :

NEW NAMES.	OLD NAMES.
The small femoro-popliteal.	

4th. Nerve which proceeds to the posterior face of the thigh, to the leg and to the foot,

Giving two branches : one (the peroniar) *furnishes ; 1st, the peroneo-cutaneous ; 2d, the prætibio-digital and the prætibio-sub-plantar. The other* (the tibial) *gives ; 1st, the digital peroniar ; 2d, the tibio-plantar.*

On the anterior and lateral parts of the bodies of the vertebræ, from the base of the cranium to the sacrum, is a series of ganglions united by a nervous cord :

The tri-splanchnic.	*The great sympathetic or intercostal nerve.*

The ganglions of the cervical region are :

1st. A *superior,* very large and fusiform.

2d. A *middle one,* very small, and often even a simple plexus.

3d. An *inferior,* round, and situated before the neck of the first rib

The ganglions of the other regions are disposed in such a manner, that they correspond nearly to the sides of each inter-vertebral space.

The nerves which communicate with the tri-splanchnic are :

Some encephalic pairs, and the thirty rachidian : they each send to it, one, two, three, four, and even five filaments.

The nerves furnished by the tri-splanchnic, either from its ganglions or the cord which unites them, are distributed chiefly to the arteries of the organs contained in the three large cavities.

In their distribution these nerves form, or contribute to form, a great number of plexus ; such as,

1st. The plexus, which surrounds the trunk of the anterior cerebral artery, in its passage along the inflex canal of the temporal.

2d. The plexus cardiaci.

From the fifth to the eleventh intercostal space the tri-splanchnic gives five or six filaments, which unite and form the *great splanchnic :* this nerve penetrates into the abdomen, and proceeds to an assemblage of ganglions, situated on the aorta and the pillars of the diaphragm :

Cœliac ganglion.	*Semi-lunar.*

The

The numerous filaments which proceed from the cœliac ganglion form, on the aorta, the divisions of the opisto-gastric artery, and on the superior mesenteric artery, a considerable plexus.

NEW NAMES.	OLD NAMES.
Cœliac plexus.	*Solar.*

The filaments which proceed from this plexus are distributed on the trunks of the principal arteries, surround them, and form on them the *gastric*, *hepatic*, *splenic*, *mesenteric*, &c. plexus, and accompany them in all their distributions.

Towards the eleventh and twelfth dorsal vertebræ, the tri-splanchnic gives also one or two filaments, which constitute the *small splanchnic:* this nerve penetrates into the abdomen, unites to others of the cœliac plexus, and forms a plexus around the renal and spermatic artery.

The tri-splanchnic penetrates into the pelvis, and unites on the sacrum with that on the opposite side.

SYSTEM

SYSTEM OF THE SENSES.

OF VISION.

271. The organ of ſight conſiſts eſſentially of a very thin membrane, placed at the bottom of the eye. This membrane has the property of perceiving the action of the light reflected from external bodies, and refracted on it by the tranſparent liquids of the eye.

The eyes ſeem to be wanting in zoophites, ſeveral of the articulated worms, in ſome of the larvæ of inſects, and in the acephala molluſca.

All vertebral animals have two eyes, ſituated in the cavities of the bones of the face*. They are compoſed of two or three tranſparent fluids of different denſities, placed the one before the other, each of which is contained by a thin pellicle; and they are covered at the back by the fine membrane which perceives the contact of the light.

This apparatus is contained in a common, thick, double covering, for the moſt part blackiſh in the inſide, having in it an aperture ſuſceptible of contraction, before which is placed a membranous and tranſparent ſegment of a ſphere.

* The eyes of inſects are very numerous, and have a peculiar ſtructure, which cannot be known on account of their ſmallneſs.

This organized dioptrical apparatus is nearly round in all animals; but its anterior part, more or leſs truncated, is covered by a tranſparent ſpherical ſegment called the *cornea*.

272. The *cornea* is nearly round; but its tranſverſe diameter is often ſomewhat longer: it is compoſed of laminæ cemented together, and is thicker in the middle than at the edges. In fiſhes, the cetacea, and the greater part of reptiles, it is very much flattened; ſo that the eye of theſe animals is often a hemiſphere. In the terreſtrial mammalia the cornea is a ſhort ſegment of a ſphere, ſmaller than that of the eye; and this organ is nearly round. The cornea of birds is a narrow hemiſphere, and the eye has a greater degree of projection.

Behind the cornea, and before the eye, the mammalia and birds have an *aqueous humour*, ſomewhat ſaline, the denſity of which is nearly equal to that of water: it ſeems to be contained in a very thin pellicle.

This aqueous humour is often wanting in fiſhes; the ſmall quantity of it found ſometimes in the eye of theſe animals is always viſcous: it does not exiſt in the ſepiæ.

273. *Cryſtalline humour.* Behind the aqueous humour, in the mammalia and birds, and behind the cornea of aquatic animals, is a thick, diaphanous ſubſtance, heavier than water, and enveloped,

 without

without adheſion, in a very fine membranous capſule: the *cryſtalline humour*.

In fiſhes, the cryſtalline humour is nearly round; in the mammalia it has a lenticular form; it is more flattened in birds, and ſtill more ſo in man. In all theſe animals this body is formed of two ſpherical ſegments, the poſterior of which is ſmaller. Its convexity is in the inverſe ratio of that of the cornea. The cryſtalline is harder, the greater its convexity; and its conſiſtence decreaſes from the centre to the circumference.

274. *Vitreous humour.* The cryſtalline is lodged in a depreſſion preſented to it by another body of leſs denſity, having the conſiſtence of the white of an egg, which occupies the greater part of the bottom of the eye, and is enveloped by a thin diaphanous membrane. This fluid is called the *vitreous humour.*

From the tranſparent membrane *(membrana hyaloidea)*, which envelops the vitreous humour, proceed internally a great number of thin laminæ, which croſs each other in different directions, and form lenticular cells containing the viſcous fluid.

The denſity of this fluid, which conſtitutes the vitreous humour, is greater than that of the aqueous humour, and leſs than that of the cryſtalline. This ſubſtance hardens and becomes opake by heat and by alcohol.

The anterior ſurface of the vitreous humour is ſeparated into two laminæ, one of which paſſes behind

behind the cryſtalline, and the other is reflected on its ſides.

275. *The retina.* The vitreous humour is enveloped, behind and on the ſides, by an exceedingly fine membrane, of little conſiſtency, which receives the impreſſion of the rays of light. It is only an expanſion of the optic nerve; and is diſtinguiſhed by the name of the *retina*.

The retina expands different ways on the vitreous humour; but in all animals it terminates around the aperture of the cornea, and does not paſs before the cryſtalline.

The aqueous humour, the ſubſtance of the cryſtalline, and the viſcous fluid contained in the cells of the vitreous body, are ſecreted by the ſurfaces of the membranous capſules which contain them.

Theſe three tranſparent bodies are contained in a common double covering.

276. *Sclerotica.* The exterior tunic, called the ſclerotica, is ſoft, thin, and of a cloſe texture in the greater part of the mammalia; and the eye has that round form which all fluids contained in a flexible membrane naturally tend to aſſume; but among animals, in which the configuration of the eye is different, the peculiar form of that organ depends on the greater thickneſs or ſtrength of this tunic, or on its being ſupported by ſmall bones.

This external tunic of the eye is hard and very

6 thick

thick in ſome aquatic animals, ſuch as the whale, and particularly the ſturgeon, where it is thicker than the reſt of the eye: in other fiſhes it is thin, but has the conſiſtence of a cartilage.

In birds this tunic is thin, and is divided before, into two ſmall leaves; between theſe leaves are received ſmall oſſeous laminæ which lap over each other, and form a circle or oval, proper for ſuſtaining it.

The ſclerotica has always in the fore-part a large aperture, ſhut by the cornea, with which it is united: behind, it affords a paſſage to the optic nerve by a hole or canal.

277. The *choroid membrane.* The interior face of the ſclerotica is lined by another thin tunic, called the *choroid*, united to it by a lax cellular tiſſue: before, it adheres with greater force around the aperture which covers the cornea, where there is a whitiſh viſcous and ſoft ring, called the *ciliary ligament.*

The choroid membrane is then turned forwards, and ſeems to conſtitute two folds: one of them, exceedingly thin, is folded back and diſpoſed in the form of radii *(the ciliary proceſs)*; it paſſes before the vitreous humour, in which it is depreſſed into a hollow, and terminates on the edges of the cryſtalline humour. This arrangement does not take place in fiſhes: the other fold, called the

uvea,

uvea, proceeds more forward, and forms an expanfion pierced with a hole, known by the name of the *pupil*: it is covered before with a fibrous membrane which adheres to it clofely, and which prefents ftriæ of different colours: *the iris* *.

The iris has the property of dilating and contracting, for the purpofe of diminifhing or enlarging the pupil.

In the ftate of dilatation, the pupil is generally round; but when the iris dilates, this aperture, in contracting, often changes its form. In man, apes, many carnivorous animals, and birds, it retains its round form; in cats it affumes that of a lozenge, which goes on always contracting, and at length becomes a vertical line. In the horfe, the ox, and the whale, it affects the fame form, but in a tranfverfe direction.

The pupil of fome animals is fufceptible alfo of affuming various peculiar configurations, by the expanfion of the iris.

The ray and the torpedo have at the top of the iris a membrane, folded back, which is fufceptible of falling down, fo as to fhut the pupil by expanding itfelf like a curtain or blind. This peculiarity has been remarked in thefe animals only.

* In moft of the mammalia the iris has a brown colour; and in birds it is ornamented with the moft beautiful tints.

It

It has been obſerved, that the pupil in the fœtus of ſeveral animals is ſhut by a thin membrane (*the pupillary*), which is deſtroyed and diſappears ſome time before birth.

All this part of the choroid, which forms the uvea and the iris, is generally plane, and ſometimes a little convex; between it and the cornea the aqueous humour is lodged.

The choroid, which is much thinner than the ſclerotica, is formed of a beautiful vaſcular tiſſue: in the mammalia a part of it is often coloured.

In fiſhes with fixed branchiæ it is compoſed of two diſtinct laminæ, between which is a ſoft glandulous cylindric body, very often of a beautiful red colour.

The choroid is generally covered with a blackiſh, mucous ſubſtance, often very thin, which does not prevent from being ſeen through it the beautiful colours with which in ſome animals * it is ornamented: it covers alſo the interior face of the ciliary proceſs of the uvea. This blackiſh, mucous ſubſtance, which is found in almoſt all animals, is wanting in the *Albinos*, among whom a ſtate of whiteneſs is always a diſeaſe.

* In the ox this part is of a beautiful golden green changing to ſky-blue; in the horſe, the goat, the cervine antelope, and the ſtag, it is a ſilvery blue changing to violet; in the ſheep, of a pale golden green, and ſometimes blueiſh; in the lion, the cat, and the dolphin, it is of a pale golden yellow; in the dog, the wolf, and the badger, it is pure white, bordered with blue.

278. *The*

278. *The orbits.* In all animals the eyes are placed in cavities of greater or leſs depth, called the orbitar foſſæ, or orbits.

The orbits of fiſhes are not very diſtinct, being confounded externally with the temporal foſſæ; the inferior edge of them is formed of one oſſeous piece, or a ſeries of ſmall bones, which, for the moſt part, are five in number. In birds they conſiſt in a depreſſion interrupted at the bottom. In reptiles the exterior edge of the orbits is formed, in whole or in part, by an oſſeous branch, behind which the temporal foſſæ are confounded with the orbitar.

In quadrupeds is obſerved alſo an aſcending branch, which forms, on the outſide, a complete border to the orbits; but behind this border the exterior ſide is wanting, and the orbitar and the temporal foſſæ are united. In man and apes theſe orbits are complete.

In apes, and in man, the edges of the orbits are formed by the frontal, the ſuper-maxillary, and the jugal bones. The ſides are formed by the frontal, the ethmoid, the lacrymal, the palatine, the ſuper-maxillary, the jugal, and the ſphenoid: the cavity which they compoſe is a cone, the apex or point of which is turned backwards.

The orbitar foſſæ ſometimes are ſeparated from each other only by a thin lamina, which is often in part wanting, as is the caſe in fiſhes; but, in general, they are ſeparated by the noſtrils.

Theſe

Theſe foſſæ, in moſt animals, are turned more or leſs towards the ſides; in ſome reptiles and ſeveral fiſhes* they are turned upwards, and in the quadrumana and man they look almoſt directly forwards.

The eyes reſt in the orbits on a ſmall cuſhion of very fine fat, which permits them to glide with great facility; this cuſhion is thicker in the mammalia, the orbits of which are deeper. In fiſhes it is formed of a gelatinous ſubſtance, enveloped by a lax cellular tiſſue; but in the ray and ſhark the eyes are articulated on a cartilaginous peduncle, which is itſelf articulated in the bottom of the orbit.

279. *Muſcles of the eye.* The eye, in man, apes, birds, and fiſhes, is moved by ſix muſcles; in moſt of the mammalia by ſeven. Theſe muſcles are fixed to the bottom of the orbit, and are attached before on the contour of the ſclerotica. Of theſe muſcles, four are *ſtraight*, and placed on the four ſides of the orbit; the two others have an *oblique* direction.

280. *Eye-lids.* In fiſhes, ſerpents, and ſome other reptiles, the eye-lids are wanting; lizards and the moon-fiſh have one of a circular form; in the mammalia there are two. Birds and ſeveral reptiles have three; in theſe animals the third eye-

* The pleuronectes have the two orbits on the ſame ſide of the head; but only one of them is perfect.

 lid,

lid, *membrana nictitans*, is found towards the interior angle; it is thin, and extends over the eye like a curtain, by a muſcular arrangement altogether peculiar: this fine eye-lid permits birds to ſee through it, and to look at the ſun.

The mammalia, towards the interior angle of the eye, inſtead of the third eye-lid of birds, are furniſhed with a membranous fold, which in man and apes is very ſmall, and has the form of a creſcent. In the other mammalia it is larger, ſemilunar, and porous; and in part of its extent has the appearance of a cartilaginous lamina.

The eye-lids ſeem to be merely a prolongation of the ſkin: the interior face of them is reflected on the eye, and forms the white of it, called the *membrana conjunctiva.*

The eye-lids are cloſed by the action of a muſcle, called *the palpebralian*, the fibres of which are diſpoſed in the form of radii: in birds they have alſo in their thickneſs a membrane which lines the inſide of the orbit.

In moſt of the mammalia, the edge of the eyelids is terminated by a cartilaginous circle, *the tarſus*, furniſhed with hair, *eye-laſhes*. In theſe animals the upper eye-lid is the largeſt, and, by falling down, covers the greater part of the eye: it is raiſed by a particular muſcle called the *ſuperior orbito-palpebralian*, which is attached in the bottom of the arch of the orbit.

The

The eye lids of birds have, in general, a contrary diſpoſition: the lower, which is the largeſt, is lined by an ovoid, cartilaginous membrane, and by riſing up covers a great part of the eye: it is pulled down by a particular muſcle, which is attached to the bottom of the orbit.

The eyes of animals which live in the air are continually moiſtened by a fluid (tears) ſecreted from a particular gland, called the *lacrymal.* This gland is ſituated at the top, and often around the orbit; it is of a white or grayiſh colour, granulated, and often divided into ſeveral follicles, from which proceed very fine ſmall ducts, having their apertures near the interior edge of the eye-lids.

The liquid which diſtills from them, being diffuſed over the eye, ſerves to moiſten it; and the ſuperfluous part, proceeding towards the interior angle of the orbit, is in general abſorbed by two ſmall tubercles, having each at the ſummit a fiſtulous hole, *puncta lacrymalia:* theſe holes are continued in two ſmall ducts, which proceed to a common excavation, *ſaccus lacrymalis,* and terminate at the noſe in a particular duct called the *naſal.*

In ſome ſpecies, ſuch as hares and rabbits, the tears trickle down by a ſinuous and cartilaginous furrow, which ends in a common bag furniſhed with a valvula.

In the mammalia the edge of the eye-lids is furniſhed alſo with a great number of glandulous

 follicles,

follicles, which ſecrete an unctuous humour called the gum of the eyes. Birds, and ſome of the mammalia, towards the interior angle of the orbit, have a ſmall gland of a different form, which ſecretes a thick humour, yellowiſh in birds, and whitiſh in the mammalia. This gland, called that of *Harderus*, pours the product of its ſecretion through an aperture ſituated behind the third eye-lid, or its repreſentative: it is the largeſt of thoſe of birds.

The mammalia have alſo, towards the naſal angle, a ſmall reddiſh body conſiſting of ſeveral glandulous follicles, *caruncula lacrymalis*, which ſecretes a thick and whitiſh humour.

281. *In man*, the eyes are placed in complete orbits, which have the form of a cone irregularly flattened; the baſe forms the entrance, and the apex is turned inwards and backwards.

At the bottom of the upper ſide is the *ocular foramen*, and below and within this hole is the *ſphenoidal fiſſure*. Along the exterior and inferior angle is the *ſpheno-maxillary* fiſſure, before which is the ſub-orbitar canal: towards the interior angle is obſerved alſo the *foſſa lacrymalis*.

The orbitar foſſa preſents alſo ſmall holes, which afford a paſſage to veſſels and nerves, and an excavation which lodges a gland.

The eye has a round form, ſomewhat depreſſed at the top, at the bottom, and on the ſides.

The

The cornea is the ſegment of a ſmaller ſphere than that of the eye; it is tranſparent, cartilaginous, and unites with the ſclerotica by an edge cut externally into a bevel.

The aqueous humour, which is diaphanous, and nearly of the ſame denſity as water, is lodged between the cornea and the iris; and a ſmall quantity of it is contained even between the iris and the cryſtalline. It appears to be ſecreted and contained by an exceedingly fine membrane.

The cryſtalline is lodged behind the aqueous humour, in a depreſſion of the vitreous body.

It is lenticular, and more convex behind; it is from four to five lines in diameter, and ſomewhat more than two lines in thickneſs; it is rounder in the fœtus, and with age becomes flattened, yellow, and muddy. Its denſity increaſes from the centre to the circumference; it appears to be formed of fibrous ſtrata, placed one above the other: the capſule, by which it is enveloped without adhering to it, is moiſtened by a humour called that of *Morgagni*, which is rarer before.

The vitreous humour fills up behind, the greater part of the eye; it occupies $\frac{15}{22}$ of its whole axis; while the cryſtalline occupies only $\frac{1}{22}$, and the aqueous humour $\frac{3}{22}$: its denſity is greater than that of water.

The *hyaloid* membrane, which retains it, gives birth to a great many expanſions; and theſe by

 croſſing

croſſing form regular cells which communicate with each other.

The hyaloid membrane is divided before into two laminæ, one of which paſſes behind the cryſtalline humour; the other proceeds before, under the ciliary proceſſes, which imprint on it blackiſh ſtriæ, and is confounded with the anterior part of the capſule of the cryſtalline. The circular ſpace comprehended between theſe two laminæ forms, on the edge of the cryſtalline humour, a triangular plaited canal, which is rendered apparent by forcing into it ſome bubbles of air.

The retina, which is an expanſion of the optic nerve, is a membrane of a white aſh colour, and of a ſoftiſh conſiſtence: it ſeems to be fibrous and vaſcular without, and villous within.

Soëmering diſcovered in the poſterior part of the retina a very ſmall hole, the edges of which are plaited, and of a *yellow colour:* this hole, which has been found in the ape, has not been obſerved in other animals.

The retina, after enveloping the whole vitreous humour, continues before, and terminates behind the ciliary proceſſes.

The humours of the eye are contained in two membranes.

1ſt, The ſclerotica, which is thick, white, and of a cloſe texture; it has before a large aperture, cloſed by the cornea with which it is united.

Behind,

Behind, it affords a paſſage to the ocular nerve, and is traverſed in an oblique direction, throughout the reſt of its extent, by veſſels and nerves.

2d, The choroid, which covers the ſclerotica internally: it appears under the form of a delicate membrane of little conſiſtence, compoſed of an exceedingly fine and beautiful vaſcular reticulation. Its exterior face, which is reddiſh, adheres to the ſclerotica by a looſe cellular tiſſue, and by veſſels and nerves: the interior face, which is villous, is covered with a blackiſh coating; it is applied to the retina, and affords a paſſage to the ocular nerve.

Before, the choroid is confounded with the ſclerotica around the cornea, where the ciliary ligament is found, under the form of a thick ſpongy and whitiſh ring.

Below this ring ariſe the ciliary proceſſes, which appear to be a continuation of the choroid. They expand before the vitreous humour, and terminate in a ſerrated border around the cryſtalline.

The ciliary proceſſes are compoſed of a radiated membrane, ſmooth before, and plaited behind; the projections of the folds are covered with a blackiſh ſubſtance, like the choroid, and are depreſſed into a hollow before the vitreous humour. This blackiſh ſubſtance, or varniſh, remains on the vitreous humour when the ciliary proceſſes are removed,

and produces a radiated ring formed of black ſtriæ.

Before the ciliary ligament is the commencement of the uveous membrane, which ſeems to be a continuation of the choroid; it proceeds directly towards the axis of the eye, before the ciliary proceſſes, and produces the aperture of the pupil.

Behind, this membrane is compoſed of fibres, which converge from the ciliary ring towards the pupil; it is covered by a blackiſh varniſh, in the ſame manner as the choroid.

Before, it is covered by numerous ſmall fibres, diſpoſed in the manner of rays, and which form the iris. Theſe ſmall fibres are ſuſceptible of elongation and contraction, for the purpoſe of contracting or enlarging the aperture of the pupil: this contraction, in all probability, is produced by a ſpontaneous afflux of blood towards that part.

In man, the colour of the iris varies.

The eyes may be covered by both the eye-lids: the upper, which is larger, is a continuation of the eye-brows.

The eye-brows reſt on the ſuperciliary arch; they are formed by the ſuperciliary muſcles, and by the ſkin, which in that part is covered with hair: theſe muſcles depreſs the eye-brows by bringing them nearer to each other.

The eye-lids are formed by the ſkin and the palpebralian

pebralian mufcle; the upper one has alfo a proper elevating mufcle. When the eye-lids are brought together, the upper one falls down as four, and the lower one rifes as one.

The free edges of the eye-lids are furnifhed with a cartilage (*tarfus*), retained by a thin ligament, the *palpebral.* The tarfian cartilage has a great many furrows, which ferve to lodge glandulous follicles, called the *glands of Meibomius:* they are of a yellowifh white colour, and fecrete the gummy matter. This thick, unctuous humour iffues through a great number of pores called the *ciliary pores.* Towards the interior commiffura, behind the membrana nictitans, is a fmall, reddifh, conical, villous tubercle, compofed for the moft part of feven fmall follicles, cemented two and two, with an odd one called the *caruncula lacrymalis.*

The edges of the eye-lids are furnifhed with one or two rows of eye-lafhes.

The fkin, which forms the eye-lids, feems to be reflected interiorly, and then to be continued before on the lobe of the eye, to form the conjunctive membrane, which appears to be continued as far as the cornea.

The conjunctive membrane is formed of a clofe, fmooth tiffue, tranfparent on the cornea: it continually fecretes a ferous matter, which moiftens the eye. Towards the interior commiffura of the eye-lids

lids is a fold in the form of a crefcent, which conftitutes a fort of membrana nictitans.

The lacrymal gland, which is oblong and of a whitifh gray colour, is fituated in the upper part of the orbit, towards its exterior angle, and is applied on the lobe of the eye. The excretory ducts of this gland open on the interior face of the upper eye-lid near its edge, where there are fix or feven fmall apertures, which pour the tears upon the eye. Thefe tears are diffufed over the whole furface of the eye by the action of the orbito-palpebralian mufcle, which always brings them back towards the interior commiffura.

The free edge of each of the eye-lids has, towards its interior angle, a small hole, the projecting mouth of which is cartilaginous. When the eye-lids are fhut thefe two holes correfpond; they are continued by two ducts, which proceed to the faccus lacrymalis.

This membranous bag is lodged in the lacrymal foffa, and is continued inferiorly with the nafal canal.

The eye is moved by fix mufcles, four of which are *ftraight* and two *oblique*. The four ftraight mufcles are attached to the bottom of the orbit, at the circumference of the ocular hole; they then proceed forwards, and each terminates in a broad tendinous expanfion on the fclerotica, embracing the contour of the globe of the eye before.

Of

Of theſe four muſcles the ſuperior elevates the eye; the inferior depreſſes it; the interior pulls it inwards, and the exterior outwards. Of the two oblique ones, the ſuperior, which is larger, is attached to the bottom of the eye, on the interior edge of the ocular hole, and changes to a tendon, which is reflected on a cartilaginous lamina fixed at the interior angle of the os frontalis. This tendon receives in that part a ſheath, and then proceeds outwards, paſſing over the ſuperior right muſcle, and is fixed at the top and behind to the exterior ſide of the eye, which it cauſes to turn inwards and downwards.

The inferior oblique muſcle, which is ſmaller, is attached to the baſe of the orbit, and to the bottom of the lacrymal canal; it proceeds backwards in an oblique direction, paſſing under the depreſſor, and fixes itſelf to the poſterior and exterior part of the eye, which it pulls upwards and outwards.

OF

OF HEARING.

282. The organ of hearing is obſerved in ſome of the molluſca, ſome inſects, and in all vertebral animals. It conſiſts chiefly of a membranous capſule, containing a viſcous fluid, in the middle of which the auditory nerve is expanded.

This capſular apparatus is found in the ear of all animals: in crabs, and the ſepiæ, it exiſts alone.

In fiſhes, the capſule, for the moſt part, is divided by ſeveral contractions; and contains one, two, or three ſmall bones of different denſities, ſuſpended in the middle of the viſcous ſubſtance. In theſe animals are obſerved three bent or ſemi-circular veſſels, the extremities of which proceed into the interior of the capſule.

In the greater part of fiſhes the whole of this apparatus is contained in the common cavity of the cranium, which has depreſſions fitted for receiving it, and ſome furrows which ſerve to lodge a part of the ſemi-circular veſſels.

In fiſhes with fixed branchiæ, this apparatus is contained in the thickneſs of the bones of the cranium, and the capſule communicates with a *conduit*, which traverſes the cranium behind. The aperture of this conduit is covered, on the outſide,

ſide, by a thin membrane called the *membrana tympani*, and by the ſkin.

The ſpace comprehended between this membrane and the capſule is called the *barrel* or *tympanum*.

In ſome reptiles the barrel is covered only by the ſkin: in the greater part of them it is furniſhed with a membrana tympani; and in all, the ſalamanders excepted, this cavity communicates with the capſule by an aperture covered with an oſſeous plate, and with the mouth by a particular conduit called the *guttural conduit*, *Euſtachian tube*.

In birds, the ſemi-circular veſſels have not a direct communication with the membranous capſule, but with an intermediate cavity, known by the name of the *veſtibulum*. In theſe animals, the capſule exhibits alſo a conical prolongation, bent and divided by a membranous partition into *two cells*, which communicate with each other: one of theſe proceeds into the *veſtibulum*, and the other into the *barrel* or *tympanum*, by an aperture covered with a very fine membrane.

In the mammalia, the organ with two cells is formed of two ſcalæ, divided by a membranous or oſſeous partition: theſe ſcalæ make ſeveral turns in a ſpiral form, ſo as to repreſent the ſhell of a ſnail, and on this account are called the *cochlea*.

The membranous apparatus of the *cochlea*, the *ſemi-circular canals*, aud the *veſtibulum*, conſtitute the MEMBRANOUS LABYRINTH.

In

In fiſhes with fixed branchiæ, this *labyrinth* is enveloped by an oſſeous ſtratum of the ſame form, very wide, and in the middle of which theſe parts are free, and as it were ſuſpended. In moſt reptiles, in birds, and in the mammalia, it is enveloped by a thin oſſeous ſtratum, which embraces it cloſely, and ſeems to have been moulded on the form of its parts: this ſolid covering conſtitutes the *oſſeous labyrinth.*

In young mammalia, the oſſeous labyrinth may be diſengaged from the body of the bone, which only ſurrounds it; but in adults it is confounded with it, and ſeems hollowed out in its ſubſtance.

The veſtibulum is pierced with ſeven apertures, viz. five for the three ſemi-circular canals, becauſe the two extremities of one of theſe canals unite before they reach the veſtibulum; the ſixth communicates with one of the ſcalæ of the organ *with two cells*, or of the *cochlea*; the ſeventh opens into the barrel or tympanum, and is covered by a ſmall bone.

In moſt of the mammalia, the cochlea makes two turns and a half in a ſpiral form; in cetaceous animals it is ſhort and plane, and makes only one turn and a half; in the Guinea pig, the cabiai, and porcupine, it is of a turreted form, and makes three turns and a half.

The barrel or tympanum, which is very large in birds, is extended in the thickneſs of the bones of the cranium. In the mammalia, it is for the

the moſt part ſingle, but ſometimes divided, as in the genus of the cat, and of the civet-cat.

In moſt reptiles, in birds, and in the mammalia, the barrel has four apertures: one is that of the veſtibulum, which is covered by an oſſeous plate; the ſecond is that of the cochlea, which is cloſed by a membrane; the third is the hole or canal that communicates with the mouth; and the fourth, which is larger, conducts to the outſide, and is ſhut by the membrana tympani. All theſe apertures are of different ſizes, and aſſume different forms and directions, in the different kinds of animals.

In fiſhes with free branchiæ, and in ſalamanders, the membrana tympani, and alſo the barrel, are wanting. This membrane, which in fiſhes with fixed branchiæ, and in ſome reptiles, is on a level with the head, is covered only by the ſkin, which in that part is often thinner.

Birds, and particularly the mammalia, have the membrana tympani placed at a greater depth in the thickneſs of the bones: in theſe animals it is fixed on an oſſeous frame, ſuſceptible at a young age of being ſeparated from the body of the bone: this frame, for the moſt part, is incomplete. The membrana tympani affects alſo different forms: in ſome reptiles it is plane; in birds it is convex on the outſide, and in the mammalia it projects inwards.

The

The offeous plate which covers the aperture of the veftibulum is for the moft part continued in a handle, or feries of fmall bones, one of which is applied to the membrana tympani, to which it adheres.

Salamanders, on the aperture of the veftibulum, have only a fmall cartilaginous piece covered by the flefh.

In ferpents and the camelion the handle of fmall bones traverfes the flefh, and refts againft the bone which fupports the lower jaw. In all thefe animals the membrana tympani is wanting.

Birds and fome reptiles have only one fmall bone; in the frog and the toad there are two, and in all the mammalia there are four.

Thefe four fmall bones are: the *malleus, incus, ftapes*, and *os orbiculare.*

The plate of the *ftapes* covers the aperture of the veftibulum; and the handle of the *malleus* adheres to the membrana tympani.

Thefe fmall bones are moved by one or more fmall mufcles, which are often fcarcely perceptible. Birds have one, and the mammalia three: in the latter, two are attached to the malleus, and one to the ftapes.

Fifhes and reptiles have no exterior auditory conduit.

Birds have one, which is very fhort: the exterior orifice is furrounded and covered by a few very

fine feathers, difpofed in a manner altogether peculiar.

In the mammalia, the auditory conduit is of greater extent, and affects various directions: it is in part offeous, and is generally terminated on the outfide by a cartilaginous expanfion, *concha*, of different forms and fizes, and more or lefs moveable by means of particular mufcles.

Cetaceous animals have for auditory conduit a very fmall, twifted, cartilaginous canal, which is lodged in the thicknefs of the fat.

In feveral of the mammalia the concha is wanting.

283. *In man*, the organ of hearing confifts alfo of a membranous labyrinth contained in an offeous one, a barrel or tympanum, an auditory conduit, and a concha.

The membranous labyrinth is compofed of a capfule containing a vifcous fluid, in which is found the labyrinthic nerve: this foft and pulpy nerve expands into a reticulation in the different excavations of that part.

The membranous labyrinth has the fame form as the offeous one in which it is contained. It confifts of a cochlea, a veftibulum, and three femicircular canals. All this apparatus, contained in the petrous portion of the temporal bone, feems, in the fœtus, to be feparated from the reft of the bone; but in the courfe of time it becomes con-

founded with it, and appears to be hollowed out in the ſubſtance of it.

The cochlea is placed over and correſponds with the carotid canal; its cavity preſents a double ſpiral, which makes two turns and a half. The baſe of the centre of the ſpiral correſponds nearly with the acouſtic foramen; it is pierced with ſeveral holes to afford a paſſage to the filaments of the labyrinthic nerve, and its ſummit directed outwards, and upwards terminates in a ſort of funnel.

The partition which ſeparates the two ſcalæ of the cochlea is half oſſeous and half membranous: the oſſeous part is towards the axis.

Of the two ſcalæ of the cochlea, the interior, which is larger and ſhorter,. is terminated at the baſe by a round aperture that proceeds to the barrel or tympanum: *foramen of the cochlea.*

The exterior one, which is narrower and longer, ends at the veſtibulum: theſe two ſcalæ communicate with each other at the ſummit of the cochlea.

The three ſemi-circular canals, ſituated behind the cochlea, are ſeparated from that part by the cavity of the veſtibulum. They form three arcs, the two extremities of which are widened and proceed into the veſtibulum. The three ſemi-circular canals give only five apertures in the veſtibular cavity, becauſe two of them are confounded together on entering it.

The veſtibulum forms an intermediate cavity between the cochlea and the three ſemi-circular canals. It is of a round form, and preſents in the inſide: the five apertures of the ſemi-circular canals; the orifice of the exterior ſcala of the cochlea; an oval hole which enters the tympanum; and a ſmall triangular aperture which penetrates into the cranium. This aperture is terminated by a ſlit towards the middle of the ſuperior edge of the apophyſis petroſa, where it conducts to a *receptacle* formed by the two laminæ of the meninx, and which contains a ſerous matter: *aqueduct of the veſtibulum or of cotunni.*

Near the aperture of the interior ſcala of the cochlea is another very ſmall one, which proceeds to the interior of the cranium, opening in the middle of the poſterior edge of the apophyſis petroſa: *aqueduct of the cochlea.*

The oſſeous labyrinth communicates with the tympanic cavity by the aperture of the cochlea and that of the veſtibulum.

The tympanic cavity correſponds with the exterior ſide of the labyrinth; it is round, contains a ſeries of four ſmall bones, and exhibits ſeveral apertures.

Of the apertures which enter the tympanic cavity, one of them, of a round form, communicates with it at the bottom of the interior ſcala of the cochlea; the other, which is oval, opens into the

 veſtibulum;

vestibulum; it is covered by the base of the stapes. These two apertures are separated by a round eminence called the *promontory.*

The tympanic cavity exhibits also before, an aperture divided at its entrance by an osseous plate shaped like the mouth of a spoon: this aperture affords a passage, above the plate, to the interior muscle of the malleus, and below to the *guttural conduit of the ear.*

This conduit, which is very narrow, issues from the temporal above the inflex canal of that bone; it becomes cartilaginous, and forms a sort of *Eustachian tube,* which proceeds to the bottom of the mouth behind the nasal fossæ. This conduit, which establishes a communication between the back part of the mouth and the tympanic cavity, is lined with a mucous membrane.

Behind, the tympanic cavity presents a triangular aperture, which proceeds into the mastoidian cells; these cells are not very apparent in infancy, but expand with age. At the top and behind, it exhibits a sort of pyramid, having at its base an aperture which communicates with the spiroid canal of the temporal bone, and affords a passage to the tympanic nerve. At the bottom it has a small slit through which pass one of the muscles of the malleus and the tympanic nerve, *glenoidal fissure.* At the lower part it has several small holes for the passage of the sanguine vessels.

The

The four ſmall bones, contained in the cavity of the tympanum, are the ſtapes, the os orbiculare, the incus and the malleus.

The *ſtapes* has exactly the form indicated by its name; the baſe of it is applied to the oval aperture of the veſtibulum, where it is retained by an expanſion of the perioſteum. On the ſummit it has a ſmall cavity which receives the *os orbiculare.*

This bone, which is exceedingly ſmall, is found between the ſtapes and the long branch of the incus.

The *incus* conſiſts of a body and two branches; the body has an elliptic cavity, which receives the head of the malleus.

The *malleus* has the form of a club; its head, turned upwards and backwards, is articulated with the body of the incus; its neck has a long ſlender apophyſis, and its handle another ſhorter one, which is turned outwards and upwards. The extremity of the handle of the malleus is fixed towards the middle part of the membrane of the tympanum.

Theſe bones are moved by three muſcles, two of which belong to the malleus, and the third to the ſtapes.

Of the two *muſcles of the malleus,* the *interior* one is attached to the apophyſis placed below the neck of that bone, and proceeds in the canal of the guttural conduit of the ear: it ſeems as if intend-

ed to pull the malleus inwards and forwards, and to ſtretch the tympanic membrane. The anterior, which is leſs apparent, is attached to the long apophyſis of the neck of the malleus; iſſues through the glenoidal fiſſure, and is attached to the exterior ſide of the guttural conduit: it ſeems intended to pull the malleus outwards and forwards, and to relax the tympanic membrane.

The *muſcle* of the *ſtapes* is the ſmalleſt: it is attached, on one ſide, to the ſummit of the pyramid, and on the other to the neck of the ſtapes. Its action ſeems to be to pull the ſtapes outwards, and to ſtretch the membrane which retains the baſe of that bone around the aperture of the veſtibulum.

The four ſmall bones, by their union, form a chain between the aperture of the veſtibulum and the tympanic membrane.

This membrane forms the exterior ſide of the tympanic cavity. It correſponds, without, to the bottom of the auditory conduit, and ſeparates the interior from the exterior part of the ear. In the fœtus, it adheres around an oſſeous ring incomplete at the top. This ring, in adults, is confounded with the body of the bone, and is converted into an oſſeous conduit.

The membrana tympani has an oblique direction; it projects outwards, and in the middle adheres to the extremity of the malleus; it is thin and

and tranſparent, and ſeems ſuſceptible of being ſeparated into four thin leaves.

On the exterior ſide of the membrana tympani there is found, in adults, an oſſeous conduit of eight or ten lines, ſlightly bent downwards. This conduit, which is broad at the bottom, has afterwards a ſort of contraction, and becomes wider on the outſide.

The edges of the exterior orifice of this oſſeous conduit are unequal, and have attached to them a cartilaginous cornet, which becomes wider, and forms a cavity: *concha.*

The exterior edges of the concha are produced by a cartilaginous thick roll, called the *anthelix.* This roll is ſingle towards the lower part of the ear, and at the upper is divided into two grooves, which leave between them a ſmall foſſa, called the *navicular.*

From the upper part of the concha ariſes another cartilaginous roll, which proceeding upwards, and then backwards, marks out the contour of the ear: *helix.* It is terminated, at the bottom, by a ſoft flexible appendix. The interval between the two rolls is marked by a *groove.*

Before the concha is a triangular eminence, which riſes above the middle of its cavity, *tragus*; oppoſite to this eminence is another, towards the lower part of the anthelix: it is ſeparated from the former by a deep groove, *antitragus.* The whole diſ-

 poſition

poſition of the exterior ear is ſuch, that the ſonorous radii, which fall on theſe different parts, are reflected towards the auditory conduit.

The exterior ear, which is formed of a cartilaginous ſubſtance covered by the ſkin, is retained by three ligamentous expanſions, and exhibits the elements of ſeveral muſcles.

Of three ligaments which proceed towards the cartilage of the ear, the *upper* one ariſes from the exterior aponeuroſis of the temporo-maxillian muſcle; the *anterior*, from the baſe of the zygomatic apophyſis; and the *poſterior*, from the baſe of the maſtoidian apophyſis.

Of the muſcles of the ear, three are ſituated around the exterior part of it, and could move it if they were more prominent: one of them is at the top, the other below, and the third behind. *Exterior muſcles.*

The reſt, ſtill leſs apparent, are ſituated on the interior part, and do not extend beyond it. *Interior muſcles.*

284. *The exterior muſcles.* The *ſuperior* extends from the aponeuroſis of the occipito-frontian, to the navicular foſſa, *temporo-auriculian*: it would tend to raiſe the cartilage of the ear.

The *anterior* extends from the aponeuroſis of the occipito-frontian, above the zygomatic apophyſis, as far as the anterior part of the helix: the *zygomato auriculian*; it would draw the ear forwards.

The

The *poſterior*, which is the moſt apparent, varies both in its form and poſition, and is often divided: it extends, in general, from the maſtoid apophyſis to the poſterior part of the concha, the *maſtoido-auriculian*; it would tend to pull the ear backwards. In ſome perſons this muſcle has been ſeen to perform very ſtriking movements.

The muſcles called *interior* conſiſt of ſome pale fleſhy fibres, ſcarcely ſenſible, diffuſed over the helix, the tragus, the anti-tragus, and the concha; the *great* and the *ſmall heliſian*, the *tragian*, the *anti-tragian*, and the *tranſverſian*.

The ſkin of the interior part of the concha, and that of the exterior auditory conduit, contain a great number of glandulous follicles, which ſecrete a thick humour of a yellowiſh colour, and ſimilar to wax, called the *cerumen*.

The entrance of the auditory conduit is covered alſo with very fine hairs, proper for intercepting ſmall bodies which might be introduced into that cavity.

OF SMELLING.

285. The organ of ſmelling conſiſts chiefly of a membrane called the *olfactory*, which lines the folds of the naſal foſſæ, and which has the property of perceiving the contact of certain moleculæ of matter.

The naſal foſſæ ſerve always for affording a paſſage to the air, in the reſpiration of animals with lungs; in fiſhes theſe foſſæ are hollowed out only in the thickneſs of the ſnout.

The organ of ſmell ſeems to be ſtronger, according as the olfactory membrane is of greater extent.

The naſal foſſæ of the mammalia are formed by the os ethmoides, its anfractuoſities and its turbinated portions, the vomer, the bones of the noſe, the ſuper-maxillary bone, the inter-maxillary, the ſphenoid, and the palatine.

The naſal foſſæ are of greater or leſs extent, being ſometimes broad and ſometimes narrow: the entrance of them is generally turned forwards; in cetaceous animals, and birds, they are turned upwards.

Some fiſhes, ſuch as the toad-fiſh, have their noſtrils ſupported by pedunculi.

The

The ſize of the noſtrils is much increaſed by the numerous twiſted folds, communicating with each other, of the ethmoid; and of its turbinated portions, which have a ſpiral form. Theſe turbinated bones, in moſt of the mammalia, are very large, and turned round in a very ſingular manner: in birds they are, for the moſt part, cartilaginous, and large, eſpecially in birds of prey.

Reptiles have ſome membranous laminæ, which enlarge the ſurfaces of their naſal foſſæ.

In fiſhes, theſe ſurfaces are enlarged by membranous prolongations, which are indefinitely ſubdivided in wonderful order.

In the mammalia, the naſal foſſæ have a communication with cavities formed in the thickneſs of the frontal bone, the maxillary and the ſphenoid; theſe cavities, which communicate with the naſal foſſæ by narrow apertures, are diſtinguiſhed by the names of: *the frontal*, *maxillary*, and *ſphenoidal ſinuſes*, according to the bones in which they are formed.

The *frontal ſinuſes* are wanting in ſome of the rodentia, ſome edentia, and ſeveral other animals; they are very ſmall or are wanting in apes; in man, and in many of the mammalia, they are very ſtriking; and in ſome carnivorous animals, ſuch as the dog, wolf, and fox, and particularly in ſome ruminating animals, as the ox, the goat and the ſheep, they are of great extent: they are very large

large alſo in the ſwine, and exceedingly large in the elephant.

The *maxillary ſinuſes* are generally very ſmall in carnivorous animals, in moſt of the rodentia and edentia. In ruminating animals, and in ſeveral more of the mammalia, they are very large.

The *ſphenoidal ſinuſes* are wanting in moſt animals, and particularly in thoſe which have the body of the ſphenoid very much flattened. They are ſmall in the ſwine and the hippopotamus, and very large in the elephant.

Cetaceous animals have no ſinuſes. In birds the cavities of the bones of the cranium have a communication with the ears, and not with the noſtrils.

The naſal cavities and their numerous folds are covered by a perioſteum, like all the other bones. But this perioſteum is lined with a fungous, thick and very red membrane, on which is expanded a beautiful vaſcular reticulation; it is furniſhed with glandulous follicles, which ſecrete a peculiar kind of mucous matter, and adheres very ſtrongly to the perioſteum.

The membrane which covers the inſide of the ſinuſes, and ſerves them as a perioſteum, is very thin: it is ſmooth, and ſeems to be of a texture different from that which lines the noſtrils.

The ſummit of the ethmoid bone, which correſponds to the baſe of the cranium, in all the mammalia,

mammalia, cetaceous animals excepted, is pierced with a great number of ſmall holes: in other animals it has only one hole or canal. Theſe holes afford a paſſage to branches of the ethmoidal nerve, which expand over the whole ſurface of the naſal membrane.

The number and ſize of theſe holes ſeem to be proportioned to the power of ſmelling: in carnivorous animals they are very numerous.

To the fore-part of the bones, which form the anterior edges of the naſal cavities, and the oſſeous plate which ſeparates theſe cavities, are attached cartilages, which are prolonged in order to form the edges of the noſtrils. Theſe cartilaginous edges are of different ſizes, and aſſume various configurations in different animals; in the greater part of the mammalia they are moved by ſome particular muſcles, fixed on the cheeks, and which tend to dilate or to contract the entrance of the naſal cavities, and to move, in different directions, the projecting muzzle of ſome ſpecies, ſuch as the ſwine's ſnout.

In the elephant, the noſtrils affect a configuration altogether peculiar; they are continued in the form of a very elongated cone, which conſtitutes the trunk. This canal, which is broader at the root, and divided by a partition, has two ſpiral turns towards its baſe, and communicates with the oſſeous noſtrils by means of a valve, which can be raiſed.

The

The trunk of the elephant is lined with an aponeurotic membrane, pierced with holes through which oozes a viſcous liquid. The ſides are formed of two layers of fibres, one of which proceeds, in a radiated form, from the interior aponeuroſis towards another aponeuroſis beneath the ſkin: theſe fibres, by contracting, render thinner and extend the ſides of the trunk, without diminiſhing its cavity; the other layer conſiſts of ſhort longitudinal fibres, placed quite around it, and proper for ſhortening the trunk partially.

Moſt reptiles have ſome ſmall muſcles for dilating or contracting the entrance of the noſtrils. In birds, the aperture of the noſtrils is ſurrounded only by a roll of the ſkin. In fiſhes, they are narrower at the bottom, and ſuſceptible of ſome movement.

In cetaceous animals, the noſtrils exhibit no projecting folds in the inſide, and have no communication with the ſinuſes; they are lined with a thin membrane of a cloſe and ſmooth texture, the ſtructure of which has no reſemblance to that with which theſe cavities are covered in other animals: the ethmoid has no aperture, and there is no olfactory nerve; ſo that it is highly probable that the noſtrils in theſe animals cannot ſerve as the organ of ſmelling. Their peculiar ſtructure renders them proper for another purpoſe; they are divided, at their oſſeous entrance, by a valve which can be

be raiſed; the inferior part, or that which correſponds to the pharynx, is provided with a very ſtrong muſcular apparatus, and in the ſuperior or external part is a cavity, the contractible ſides of which terminate outwardly in the narrow aperture of the noſtrils. Theſe animals, by means of this arrangement, can throw up the water, which they have in their mouth, to a very great height, through the noſtrils.

In the guttural conduit of the ear of cetaceous animals is obſerved a pretty wide hole, terminating in a large cavity, lined with a ſoft, mucous, and blackiſh membrane, which has a communication with the frontal ſinus. The nerves of this cavity, as well as thoſe of the noſtrils, proceed from a pair, (the fifth) which, in all the mammalia, ſend out others to the noſtrils; ſo that it is very probable that this peculiar apparatus ſerves as the organ of ſmelling to theſe animals.

286. *In man*, the olfactory membrane is of a moderate ſize, and of a roſe colour; is thick, of a villous texture, and contains a great number of mucous follicles, which ſecrete the mucus of the noſtrils. This membrane receives a great number of ſanguine veſſels, which ariſe chiefly from the ſpheno-palatine and ethmoidal arteries.

The ethmoidal nerve, when it arrives near the ethmoid bone, becomes thicker; aſſumes a pulpy conſiſtence,

confiſtence, and penetrates to the noſtrils by a great number of ſmall holes or oſſeous tubes, exhibited by that bone. This nerve ſeems to be excluſively appropriated to the ſenſe of ſmelling. The fifth pair furniſh, in the noſe, ſeveral nerves which ſeem to be deſtined only for the life of that organ.

The naſal foſſæ have a communication with the frontal, maxillary, ſphenoidal, and ethmoidal ſinuses; and the membrane which lines theſe ſinuſes is of a ſtructure different from that which lines the inſide of the noſtrils: it has a finer texture, is ſmoother and tranſparent: it adheres weakly to the bones, and ſerves them as a perioſteum.

The parts on which the olfactory membrane expands conſtitute the naſal foſſæ. Before and at the top, they are formed by the bones of the noſe; on the ſides, by the ſuper-maxillary, lacrymal, and ethmoid bones, and by the inferior turbinated bones; behind by the ſphenoid; at the bottom by the ſuper-maxillary bones, and thoſe of the palate. They are divided alſo longitudinally in the middle by the vomer, and the perpendicular plate of the ethmoid, and before by the cartilage by which theſe bones are continued: this plate is very often warped.

The naſal foſſæ are not very apparent in infancy, and do not attain to their complete ſize till the period of full growth; at which time they are nearly three inches in extent from before back-

wards,

wards, and two inches from the top to the bottom.

The lateral ſides of the naſal foſſæ approach each other at the top, and diverge at the bottom. The narrow ſummit of the noſtrils exhibits an arch of three planes. The anterior, which is inclined forwards, conſtitutes the arch of the noſe; the middle one, which is horizontal, exhibits the orifice of the ethmoidal holes; and the poſterior correſponds to the aperture of the ſphenoidal ſinuſes.

On the lateral ſides of the naſal foſſæ there are three turbinated bones, two of which belong to the ethmoid bone: the inferior one, for the moſt part, is free.

The *ſuperior turbinated bone* adheres to the arch of the naſal foſſæ, and is ſeparated from the middle one by a large groove, the *ſuperior meatus.* This groove exhibits before, the aperture of the poſterior ethmoidal cells; and behind, the ſphenopalatin foramen.

The *middle turbinated bone*, larger than the preceding, ſwells out before, and terminates in a point behind; it is ſeparated from the lower one by a broad groove, called the *middle meatus.* Before, this groove exhibits the common aperture of the ethmoidal cells, and of the frontal ſinuſes; and in its middle part an aperture, which proceeds into the maxillary ſinuſes.

The *inferior turbinated bone*, leſs twiſted and wider than the other two, has below it a large furrow, called the *inferior meatus*, which exhibits before the aperture of the naſal canal.

To the bones, which conſtitute the anterior aperture of the noſtrils, are affixed two cartilages, which form the arch and alæ of the noſe; and another which produces, before, the middle portion. Theſe cartilages are covered on the outſide by the ſkin, and on the inſide by the olfactory membrane: in that part, this membrane is thinner and leſs villous than in the reſt of its extent, and it exhibits there ſome very fine hairs.

The cartilages of the noſe are moved by the occipito-frontian, ſuper-maxillo-naſian, the great ſuper-maxillo-labian, and the alveolo-naſian muſcles, the uſes of which are common to the other parts.

The poſterior aperture of the naſal foſſæ correſponds to the back part of the mouth; and, at the moment of deglutition, is cloſed by the velum palati.

The ſinuſes expand with age, and give more extent to the face. The two frontal ſinuſes are divided, in the middle, by a longitudinal partition for the moſt part warped. Their extent varies a great deal; ſometimes they occupy the whole frontal region, and ſometimes they are ſcarcely apparent.

The two ſphenoidal ſinuſes are hollowed out in the

the body of the ſphenoid, the whole extent of which they ſometimes occupy, and they open behind the ſuperior turbinated bone.

The two maxillary ſinuſes are the largeſt; they occupy the whole thickneſs of the ſuper-maxillary bone; they affect a triangular form, and open into the middle meatus.

The four ethmoidal cells correſpond to the top and ſides of the naſal foſſæ, and have a communication with each other. The two exterior open into the middle meatus, with the frontal ſinus; the two poſterior proceed into the ſuperior meatus.

SYSTEM OF DIGESTION.

287. *The ſyſtem of digeſtion in animals.* The ſyſtem of digeſtion conſiſts chiefly of a membranous bag, the ſides of which ſecrete a particular juice. The aliment, introduced into this bag, is there transformed into a kind of pulp, which contains the nutritive juice. This juice is diſtributed to the different parts of the body, where it becomes mixed with the blood, and the reſiduum is diſcharged.

Some animals have merely an alimentary bag with one aperture. In the greater number, the apparatus of digeſtion conſiſts of one canal with an aperture for entrance, and another for eſcape. This apparatus, however, is rarely ſo ſimple: it is rendered complex by ſeveral dilatations, and conſiſts of different pieces.

In ſome animals the alimentary canal exhibits ſmall dilatations; but in others theſe dilatations are of conſiderable ſize, and conſtitute ſtomachs. When animals have a diſtinct ſtomach, the name of œſophagus is given to that part of the alimentary canal which proceeds into it; and that of inteſtine to the one which proceeds from it.

The juice of the alimentary canal appears to be the only one which in ſome animals ſerves for digeſtion;

tion; but in the greater number this canal alſo receives the liquors ſecreted by the liver and by the pancreas.

The entrance into the œſophagus is ſometimes a ſimple aperture; but, for the moſt part, this entrance is a mouth, formed of jaws, and furniſhed with teeth, a tongue, ſalivary glands, &c.

288. *Jaws* are found in cruſtaceous animals, inſects, and in ſeveral of the molluſca; but in theſe animals they exhibit a peculiar ſtructure, which has very little relation to that of the ſame parts in the mammalia. In ſome zoophytes, ſuch as the ſea hedge-hog and ſea-nettle, there are found alſo an organ of maſtication, and teeth moveable by the means of muſcles.

All vertebral animals are provided with two jaws*: in birds, fiſhes, and ſerpents, they are both moveable. In ſome reptiles, as the crocodile and the lizard, and in all the mammalia, the lower one alone is moveable.

In the mammalia, the lower jaw exhibits a condyle, which is articulated in a cavity of the temporal bone.

In fiſhes, reptiles, and birds, the jaw and mandible are each furniſhed with a cavity; and theſe two cavities receive an intermediate bone (*ſquare bone*), which ſerves as the means of union, and ſupplies the place of a condyle.

* Crabs have four, five, and ſometimes ten pairs of jaws.

In all vertebral animals, the jaws move vertically and horizontally; in insects they move transversally.

In serpents, the jaws, which are moveable from above downwards, can be separated also in a lateral direction, which produces an aperture capable of receiving an object of prey larger than their whole body.

Some fishes have jaws which, without any movement of the head, can be carried suddenly forwards to catch their prey; as is the case in the ray, the shark, and some reptiles.

In the mammalia, the condyles are of greater or less breadth and flattened; in ruminating animals, their transverse diameter is greatest; in the rodentia it is greatest from before backwards; and in man, the ape, &c. it is greatest in an oblique direction. In animals which do not masticate, the condyles are not very apparent; in the large carnivorous animals they are very strong, and are lodged in deep cavities, in which they are inclosed and retained by a roll and an osseous capsule.

The muscles which move the jaws vary with respect to their number in the different classes of animals. In the mammalia, these parts are elevated by four muscles, and depressed by a greater number. The former are: the crotaphite, the masseter, and the two pterygoidian; the latter are attached to the os hyoides, the base of the cranium, and to the sternum.

ſternum. Of theſe, the digaſtric of man and of apes is monogaſtric in carnivorous animals. In moſt of the carnivorous animals, ſuch as the hyena and the tiger, the crotaphite muſcles extend as far as the ſummit of the cranium, where they are fixed to a ſtrong oſſeous ridge. The maſſeter, which is very large, is attached to a prominent and extenſive zygomatic arch. Theſe two muſcles, in theſe animals, move the jaws from above downwards; and in graminivorous make them perform lateral movements.

Quadrupeds have lips which ſerve to cloſe the mouth, and to retain the aliments; in man, they contribute alſo to ſpeech and to the action of the phyſiognomy.

289. *Teeth.* Fiſhes, reptiles, and the mammalia, have jaws provided with teeth, implanted in the bodies of the maxillary bones, or retained only in the gums.

Fiſhes have teeth not only in the jaws, but alſo in the palate, the throat, on the bones which bear the branchiæ and the tongue, and even on the tongue itſelf. If this diſpoſition is favourable to maſtication, it cannot be ſo for taſting. In theſe animals the teeth, which affect different forms, are ſupported by an oſſeous tubercle covered with a membrane. When this membrane is deſtroyed, the tooth and tubercle drop out, and the place of both is afterwards ſupplied by others.

 In

In the mammalia, the teeth are of three kinds: the ſharp ones in front are called inciſors; naturaliſts always give the name of inciſors to thoſe implanted in the inter-maxillary bone; others cut into ſeveral faces correſpond to the angles of the lips, and are the angular teeth; and the large flat ones, placed backwards and on the ſides of the mouth, are the grinders or molar teeth.

In ſome animals, the teeth are ſo large, and of ſo ſingular a conformation, that they cannot be diſtinguiſhed by that name: ſuch are the tuſks of the narval and the hippopotamus; thoſe which proceed from the mouth of the wild boar, and thoſe which fall back even on the head of the barbyrouſſa.

The grinders exiſt in all animals furniſhed with teeth. The preſence of the reſt is not conſtant: grinders only are found in the edentia; inciſor teeth are wanting in the ſloth, and angular teeth in the rodentia. Ruminating animals have inciſive teeth only in the lower jaw. The three kinds are obſerved in the ſolipeda, ſeveral of the pachydermata, the carnivorous, the quadrumana, and in man. In the laſt place, the ant-eaters are deſtitute of them.

Several animals, ſuch as the ſolipeda, have a part of their jaws without teeth, *interdentium*. It is in this part that the bit of the horſe is placed.

In the hare, the fox, and often in children, the inciſors

incisors are serrated; in bats, these indentations are sometimes so deep, that they resemble the teeth of a comb; in the rodentia they are long and curved; the *didelphis marotarsus* has the angular teeth shorter than the rest; in most apes the angular teeth begin to be lengthened, and in the large carnivorous animals they are so long that they cross each other, and are received in the indentations which they mutually present.

The large surface of the grinders has various configurations; in carnivorous animals it is covered with points in one or more rows; in the pachydermata it is tuberculous, and in the large graminivorous exhibits salient lines: these lines in the ruminantia form several crescents, and in the solipeda a double festoon.

Carnivorous animals, the quadrumana and man have the teeth formed of an osseous substance, covered on the outside by a coating of enamel. In the solipeda and ruminantia the teeth consist of an osseous substance, enveloped in the membranous follicle which originally contained them. The bodies of the teeth are covered with an enamel of a golden yellow colour: the membranous follicle ossifies, and forms around the teeth a very hard cortical covering.

In the elephant and the hippopotamus, when young, they are *composed* of vertical laminæ, placed on each other without adhesion. These osseous

offeous laminæ, cut unequally at the fummit, foon unite by means of an enamelly juice, which infinuates itfelf between them, and they then form a folid tooth compofed of plates of enamel and offeous plates.

By the effect of maftication, the edge of the offeous planes foon becomes worn, and in the courfe of a few years the furface of the teeth is covered with falient and unequal lines of enamel. This difpofition, analogous to that of millftones, is exceedingly proper for maftication.

In the *oryćterope* the teeth have the porofity of reeds; they are foft, and can be eafily cut.

The name of *root* is given to that part of the teeth which is inferted in the jaw; the part without is called the *crown*; and the ftricture which often feparates thefe two parts is called the *neck*.

The fingle teeth are hollow during the firft years of their growth; the cavity lined with a thin membrane, over which the veffels and nerves are fpread, is filled with a gelatinous fubftance, and becomes partly clofed up with age.

The part firft produced is the body of the tooth; it foon fhows itfelf without, and begins to be worn before the root has attained to its full growth. When it has ceafed to grow, the capacity of the alveolus decreafes, and is gradually filled up; the root is deftroyed in the fame proportion, and the tooth thus worn at both ends becomes very fhort

at an advanced age: it then turns loose in the socket, and at last drops out.

In the ruminantia and solipeda the body of the tooth is sometimes completely worn out, and the roots are separated. In these animals the decay of the teeth is much more rapid than in the carnivorous; in man, this decay takes place in a very striking manner. The wearing out of the teeth, which goes on in a constant and regular manner, serves to indicate with precision the age of the solipeda and ruminantia.

In a great number of animals, a part of the teeth drop out, and their place is supplied by others.

Some fishes, such as the shark, have their teeth inserted in the flesh, and susceptible of being renewed four or five times: these new teeth are concealed behind those the places of which they are intended to supply. The same disposition is observed in some reptiles, as may be seen by the venomous dart of the viper.

In the mammalia, a part of the teeth drop out at a determinate period; the germs of those which succeed are placed behind the first. In the crocodile, the teeth are conical and hollow, and receive in their cavities those which are to succeed them.

The roots of the teeth which drop out are speedily destroyed; they become loose in the

sockets,

ſockets, and are forced out by thoſe which aſſume their place. This ſecond dentition ſerves to indicate the age of the animals.

290. The *tongue* is a muſcle which affects different forms: in ſome of the mammalia it is broad and ſhort; in ſeveral birds it is long and narrow; in moſt ſerpents and ſeveral lizards it is forked.

In moſt of the mammalia the tongue is covered by a mucous membrane, furniſhed with nervous papillæ proper for perceiving the impreſſion of ſavours. In ſeveral reptiles, it is covered by a ſcaly ſubſtance, and in ſome fiſhes it is furniſhed with teeth.

The tongue ſerves for maſtication, for deglutition, for the voice, and for ſpeech. It is fixed to the os hyoides by muſcles, and the point of it is generally directed forwards: in the batrachians, however, it is turned backwards. To the os hyoides, which is free and ſuſpended in the back part of the throat, the muſcles of the pharynx and of the jaw are affixed. It appears, for the moſt part, under the form of a portion of a cartilaginous cylinder; but in ſeveral animals this form varies.

The tongue, in general, poſſeſſes great mobility; in moſt animals it can be conveyed beyond the mouth, and by reptiles in a very remarkable manner.

In the green wood-pecker, the tongue, which is contained in a membranous ſheath, and armed

at

at the point with hooks, can be extended beyond the bill of the animal to a greater length than that of its body: it is lengthened and drawn back by a very curious organic diſpoſition.

291. In fiſhes the mouth communicates with the œſophagus, and with the aperture of the branchiæ; in animals with lungs, it proceeds to the œſophagus, the pharynx, and the noſtrils.

In theſe animals, which perform real maſtication, the inſide of the mouth is moiſtened not only by the ſecretion of the mucous membrane, which lines that cavity, but alſo by the ſaliva ſecreted from ſeveral glands.

In carnivorous animals, the ſaliva under certain circumſtances aſſumes a very venomous quality. This property is found in the production of a gland of the viper, and in an analogous liquor of ſome inſects.

The œſophagus is a muſculo-membranous canal, lined with a mucous membrane: its length varies as that of the neck; it proceeds to the ſtomach.

292. *The ſtomach* is a dilatation of the alimentary canal. In very ravenous fiſhes, and moſt ſerpents, this dilatation ſcarcely exiſts. In the carnivorous mammalia the ſtomach is ſingle, and not very capacious; in the graminivorous it is larger; in birds it is double, and often triple; in the

the ruminantia it is quadruple; in cetaceous animals there are five in fucceffion.

The ftomachs of infects have a great analogy with thofe of red-blooded animals. In butterflies the ftomach is merely a dilatation fcarcely fenfible, or does not exift at all; in other infects the ftomach is fingle, double, or multiple. In thofe which feed on the juice of flowers, fuch as bees, the fingle ftomach is large; in infects which fuck blood, or feed on animal matters, it is of lefs extent. Double ftomachs belong, in particular, to carnivorous infects, fuch as the coleoptera of that genus: in thefe infects, the firft ftomach is mufcular, like the gizzard of birds, and the fecond membranous: in fome there is alfo a fort of crop. Multiple ftomachs are found in infects which exercife a kind of rumination, as is the cafe with locufts.

The numerous clafs of infects, with refpect to this part, exhibit an organization exceedingly curious and complex; but we muft confine ourfelves chiefly to red-blooded animals.

The ftomach of carnivorous, and particularly of herbivorous animals, which do not ruminate, exhibits alfo one or more dilatations; but for the moft part there are two. In herbivorous animals thefe dilatations are very large; in the polyphaga they are lefs, and in the carnivorous fmall. In

the

the laſt, the ſtomach appears to be only an inteſtinal dilatation, which has little obliquity; it is in general wrinkled, and can be conſiderably diſtended to receive an ample repaſt.

The ſides of the ſtomach are for the moſt part of a muſculo-membranous nature; and the interior part of them is always covered with a mucous membrane.

In birds, which have two and for the moſt part three ſtomachs, the firſt, called the *crop*, is a membranous bag, in which ſeeds remain and become ſoft; the ſecond, *ventriculus ſuccenturiatus*, is thicker, but of leſs ſize; it is furniſhed with a great many mucous glands which ſecrete abundance of digeſtive juice. It was the juice of this ſtomach which Spallanzani employed in his ingenious experiments on the gaſtric juice. The third, or *gizzard*, is formed of two very thick muſcles; the cavity of it is not larger than the ventricle, but the thickneſs of it makes it appear much more voluminous on the outſide. The two muſcles of the gizzard exhibit, on two faces, a very ſtrong round tendon, from which the muſcular fibres extend in a diverging form. The cavity of this ſtomach is lined with a very thick mucous membrane, which may be eaſily ſeparated, and which is ſuſceptible of regeneration. The gizzard poſſeſſes a very ſtrong contractile force: its action ſeems to ſupply the place of maſtication.

Granivorous

Granivorous birds, in general, ſwallow ſmall pebbles, and the ſtrong and varied contraction of the gizzard on the ſeeds, mixed with theſe hard bodies, effects in this manner their trituration by repeated friction. In the ſtomach of the oſtrich and the caſſowary ſeveral pounds of pebbles are often found intermixed with bits of glaſs, iron, &c. In carnivorous birds the gizzard is much thinner: in thoſe which feed on fiſh or worms there is ſcarcely any. Theſe birds have no crop; and the ventricle which is their principal ſtomach is generally very large.

The gaſtric apparatus of the molluſca cephalopoda and gaſteropoda has ſome analogy with that of birds. They have a gizzard preceded by a crop. The ſtomach of the volutæ as well as of crabs is furniſhed with two oſſeous pieces proper for trituration.

In the bivalva, ſuch as the mytilus, the alimentary canal traverſes the liver, and is dilated in its thickneſs to form a ſtomach. Some of theſe animals, ſuch as the oyſter, have a ſecond ſtomach.

Ruminating animals have four ſtomachs, the aggregate of which exhibits a very remarkable ſyſtem of digeſtion.

The firſt, *ventriculus*, called *paunch* by the vulgar, is exceedingly large, and occupies a great part of the abdominal capacity; it exhibits inferiorly a longitudinal re-entering fold, which divides

vides it into two principal cavities; its interior ſurface is furniſhed with large projecting conical glands. The ſecond ſtomach, the *honeycomb, bonnet*, or *king's hood*, is round and much ſmaller; it is ſeparated from the former by a membranous partition in the form of a horſe-ſhoe, above which theſe two ſtomachs have a communication with each other. The inſide of the *bonnet* exhibits deep cells of different forms, analogous to the cells of a bee-hive.

The œſophagus communicates with theſe two ſtomachs towards their upper part, where it forms an inverted gutter, the thick edges of which can approach each other to form a duct.

This gutter, continued with the œſophagus, conſiſts of two folds, which advance in a parallel direction as far as the third ſtomach, where they interſect each other at an acute angle, and prevent the entrance of coarſe aliment. In this part the gutter exhibits furrows, which are continued with the membranous laminæ that form the third ſtomach: *omaſum* or *manyplies*.

The omaſum, of an ovoid form, and ſomewhat larger than the *bonnet*, is divided, in the direction of its two orifices, by a great many membranous partitions, which produce furrows deep and narrow, particularly towards their middle.

The ſuperior furrows are deeper and much more crooked than the inferior; the inſide of theſe fur-

rows is furniſhed with rugous glands covered with papillæ. The orifices of this ſtomach are much lower than its body: the anterior, on the left, correſponds to the *bonnet*, and the poſterior, on the right, to the *abomaſum* or fourth ſtomach.

The omaſum proceeds into the ſuperior part of the laſt ſtomach, the *abomaſum*, which is much larger than the preceding two, but leſs voluminous than the paunch: it is ſituated under the omaſum, between the bonnet and the paunch: it is ſhaped like the bag of a bag-pipe.

The aperture which forms a communication between the omaſum and the abomaſum is furniſhed with a valvula which prevents the return of the aliments. The interior part of this cavity is lined with a thick mucous membrane, which forms ſeveral longitudinal folds. This ſtomach is continued with the duodenum by a pyloric orifice higher than the preceding.

The aliments coarſely chewed at firſt are formed into balls, and conveyed ſpeedily into the bottom of the left cavity of the paunch, from which they proceed to the bottom of the cavity on the right, and place themſelves immediately below the œſophagian aperture, in the order of their entrance.

Theſe aliments become ſoft and penetrated with juices. When the animal has taken a proper quantity, and is in a ſtate of reſt and of good health, it has the faculty of making them aſcend into

into the mouth, where they are again maſticated: for this purpoſe a portion of the graſs contained in the paunch paſſes into the œſophagus; the part which is moſt maſticated falls into the bonnet, and the coarſeſt penetrated with juices is reduced to a ball, and returns to the mouth. When the latter phænomenon takes place, it is obſerved that the animal extends its neck, makes a ſtrong inſpiration, and by the ſimultaneous action of the ſides of the paunch, of the abdomen, the diaphragm, and the œſophagus, it cauſes the ball to re-aſcend with rapidity along the œſophagian canal. When it reaches the mouth it is chewed again much more ſlowly, and with great care; and the animal ſeems to find in theſe alimentary balls, penetrated with juices, a ſavour which renders the maſtication of them agreeable.

Rumination, therefore, is produced only by the firſt ſtomach. The alimentary balls, triturated and reduced to a fine pulp, re-deſcend along the œſophagus, and paſs into the gutter; the coarſeſt fall into the bonnet, the reſt remain between the furrows of the omaſum, and the moſt liquid proceed directly into the abomaſum.

The action of the bonnet prepares the aliments for being received into the omaſum, which ſoftens them, and renders them ſufficiently liquid to paſs into the abomaſum, where real digeſtion is performed.

When ruminating animals drink, or take very liquid aliment, and during lactation, these fluid substances are conveyed through the œsophagus into the gutter, the edges of which unite to form a duct, and they proceed directly into the omasum, from which they pass into the abomasum.

The paunch of the camel exhibits a peculiar dilatation, furnished with salient laminæ, like the omasum, and in which it can preserve, for a very long time, a large quantity of water.

293. *The intestines.* That part of the alimentary canal, which is below the stomach, varies both with respect to its length and to its diameter.

In animals, the length of the intestines is in the inverse ratio of the nutritive quality of the aliments on which they feed.

In some very ravenous fishes, such as the ray, the intestine is shorter than the body. In the carnivorous mammalia, it is twice or thrice that length; in the herbivorous mammalia with a single stomach, it is equal to ten or twelve times that of the body.

The capacity of the abdomen, in graminivorous animals, is for this reason much greater; while in the carnivorous the contrary is the case.

In reptiles, the intestines are of the same width throughout their whole extent; in birds, the width goes on decreasing towards the rectum.

 In

In the mammalia, the inteftines are flender in the firft part of the alimentary canal, and large in the latter.

The large inteftines often exhibit flefhy circular bands, which produce conftrictions, and make them appear as if fwelled up.

The inteftinal canal, in different parts of its extent, has one or more lateral appendices *en cul-de-fac : cœcum.*

In reptiles the cœcum is wanting. The mammalia have one ; birds have two ; and fifhes have often a very great number.

The cœcum of the mammalia is placed at the commencement of the large inteftines ; in carnivorous animals it is very fhort ; in the graminivorous it is much larger ; and in the rodentia, it has often more extent than the ftomach.

In man and fome apes, the cœcum, which is fhort, has at its extremity a fmall *vermiform appendix.*

Birds have often two cœcums on the fides of the rectum.

Some fifhes have no cœcum ; while others have a prodigious number, placed in general near the pylorus : they are thick and glandular, and feem to be organs which fecrete a liquor proper for digeftion.

The inteftine terminates, for the moft part, in an aperture furnifhed with a fphincter.

The anus is wanting in the zoophytes, which have only one aperture for the alimentary canal: it is commonly placed at the extremity of the trunk or the tail; but in the mollufca it is found on the fides of the neck.

The whole of the alimentary canal is lined with a mucous membrane, which fecretes a digeftive juice.

The inteftines receive alfo, for digeftion, the bile fecreted by the liver, and the liquor produced by the pancreas.

294. The *liver* exifts in all vertebral animals, and in all the mollufca; in infects it appears under the form of a vafcular reticulation.

The fize of the liver appears, in general, to be in the inverfe ratio of that of the organ of refpiration.

In all animals the liver occupies a great part of the abdomen; the venous blood it receives is that which returns from almoft all the abdominal vifcera; the veins of all thefe vifcera unite into a very large trunk *(the vena portæ)*, which proceeds into the liver.

The moft important ufe of the hepatic apparatus is, not to fecrete a fmall quantity of bile, but to receive a great part of the venous blood, and to make it undergo peculiar changes; fo that the hiftory of the liver belongs rather to circulation than to digeftion. However, as the bile is a liquor of

of great importance to digeſtion, the organ which ſecretes it is here worthy of attention.

The liver exhibits five orders of veſſels: 1ſt, the large arterious vein, the *ſub-hepatic* or *vena portæ*, which conveys its blood to the liver; 2d, a ſmall artery, the *hepatic*; 3d, the large vein which conveys back the blood, the *ſuper-hepatic*; 4th, the biliary veſſels; 5th, the lymphatic veſſels.

The canals which carry the bile from every part of the liver unite into one or more *hepatic* ducts, which open into the inteſtinal canal near the pylorus, and very rarely into the ſtomach.

A part of the bile often proceeds to and remains in a bladder annexed to the liver.

In the molluſca there is no bladder; it is wanting alſo in ſome of the mammalia, ſuch as the ſtag and horſe; in fiſhes it is found ſometimes in the inſide of the hepatic organ.

The bile is carried to the bladder two ways: 1ſt, it is conveyed directly from the liver by peculiar ducts, the *hepato-cyſtic*, as is the caſe in birds; 2d, the hepatic canal has a communication with a peculiar *cyſtic* duct, along which a part of the bile flows back to proceed to the bladder, as is the caſe in the mammalia.

In the firſt caſe, the bile proceeds directly from the bladder to the inteſtine by the *ductus choledochus*; in the ſecond, it re-deſcends from the cyſtic duct to paſs into the *ductus choledochus*.

295. The *ſpleen* is found in all red-blooded animals; the blood which returns from it proceeds to the liver: no other uſe of it is known than that of furniſhing all its blood to the hepatic apparatus.

296. The *pancreas* is a glandular body which ſecretes a liquor analogous to the ſaliva; this liquor proceeds into the inteſtine by a particular duct, which opens near the *ductus choledochus*.

The pancreas is found in almoſt all animals which have a liver; it is wanting, however, in the molluſca, and in all fiſhes which have a great number of cœcums.

Birds have two or three pancreases, which pour their liquor into the inteſtine by peculiar ducts.

297. *Peritonæum.* The gaſtric and other organs contained in the abdomen are enveloped by a double membrane, called the peritonæum.

In the mammalia, the peritonæum is of a vaſcular texture, lax, tranſparent and greaſy: in fiſhes, it is of a cloſe texture and opake, has a brilliant metallic appearance, and is covered with a black varniſh.

The exterior membrane of the peritonæum lines the ſides of the lower belly; the interior ſeems to be prolonged different ways to envelop each organ, and to retain it in a determinate poſition.

The

The portion of the peritonæum which covers the inteſtines, forms, after it has enveloped them, a looſe and ſmooth membrane, which keeps them fixed to the vertebral column: *the meſentery.*

The peritonæum produces alſo a large membranous fold, which covers like an apron the anterior part of the inteſtines: the *epiploon* (omentum).

In man, the epiploon deſcends as far as the abdomen, and on the bladder; in apes, which have an open inguinal ring, it falls back towards the pelvis, and forms a ſecond covering.

Animals ſubject to winter-ſleep have ſeveral epiploons, which become charged with fat: this fat ſeems to ſerve for their nutrition during their ſtate of torpor.

Birds have no epiploon; their large membranous and aërian bags become charged with fat.

298. SYSTEM OF DIGESTION IN MAN. In man, the ſyſtem of digeſtion holds a mean place, in ſeveral reſpects, between that of carnivorous and that of graminivorous animals.

The ſides of the mouth are formed, above and before, by the maxillary bones, and behind by the palatine bones, the pterygoid apophyſes, and the guttural foſſa; below, by the under jaw and the teeth.

299. *The teeth.* Man has two inciſor teeth, one angular (*cuſpidatus*), two ſmall and three large molar teeth, on each ſide of each jaw.

In

In the embryo, the rudiments of the teeth are ſcarcely apparent; they are nothing then but a mucilage confounded with the other parts; and do not expand till towards the fourth month of geſtation: at that period they preſent themſelves under the form of a follicle or membranous bag, traverſed by a very great number of veſſels, and filled with a gelatinous mucus.

The follicles of the inciſors firſt appear, then thoſe of the angular teeth, and in the laſt place the great and ſmall molares. Theſe follicles, which are of an ovoid form, adherent to the alveoli, are at firſt reddiſh; they then become white, aſſume a cartilaginous conſiſtence, and expand by a point of oſſification. The ſurface which correſponds to the body of the tooth begins to be covered with a thin cortical coating of enamel.

Towards the ſixth or eighth month after birth, the lower inciſor teeth and the ſuperior paſs through the gums, and ſhow themſelves without; the angular teeth appear towards the end of the firſt year, and the ſmall molares at the end of the ſecond.

Behind the follicles of theſe firſt twenty teeth there are others of a ſimilar kind, which gradually increaſe, and about the ſixth or ſeventh year * aſſume the place of the firſt. At that period the roots of the firſt teeth, in a great meaſure deſtroyed,

* All theſe periods are ſubject to much variation.

become

become loofe, and the teeth drop out *. The fecond teeth affume the place of the firft, nearly in the fame order as that in which they appear: the firft fmall molar tooth of the firft dentition is fucceeded by two others, which become the two fmall molares. The laft four appear at a period exceedingly variable, often towards the twentieth year; and fometimes they remain in the alveoli, or do not iffue from them till a very advanced age.

The dentes molares have four roots; the reft have only one.

At the period when the teeth appear without the gums, the fhort truncated roots are hollow; and their canal communicates with a large cavity which is found in the middle of the body of the tooth. Thefe cavities are lined with a membrane covered with nerves and veffels; and they are filled with a gelatinous juice.

The teeth are formed of a compact, offeous fubftance, of the fame nature as that of the other bones; the bodies of them are covered even below the gums by a coating of enamel, which is thicker at the fummit, and of a brilliant milk white colour. This enamel is phofphate of lime difpofed in regular ftriæ, which feem to proceed from the centre to the circumference.

* When they begin to fhake, it is often neceffary to extract them, that their prefence may not oblige the others to affume a bad pofition.

As man approaches the period of full growth, the roots of the teeth lengthen, and ſoon increaſe to their full extent; the enamel then becomes blueiſh, and the tooth acquires greater hardneſs.

The teeth become worn in a ſenſible manner by the friction of maſtication; the inciſors, often indented or notched, exhibit towards the fifteenth year a ſharp edge. From the twentieth to the thirtieth the cavity of the teeth ſenſibly diminiſhes; the enamel aſſumes a grayiſh tint; the tubercles of the molar teeth ſubſide, and the other teeth continue to be worn; the roots are ſhortened, and towards the forty-fifth year the teeth have loſt a fourth part of their height.

By the progreſs of age, the enamel aſſumes a yellowiſh tint, and proceeds no further than to the gums; the cavities of the teeth are obſtructed and filled up with a yellow oſſeous matter. They continue to wear away by maſtication; and the tooth which has loſt two thirds of its height, about the age of ſixty or ſeventy, exhibits only a circle of enamel at its circumference, and a large yellow ſpot in the middle. The root continues to be deſtroyed, the ſocket becomes ſhallower, and the tooth, looſened, at length drops out.

300. *Inſide of the mouth.* Every part of the mouth is covered by a membrane which is continued with the ſkin of the gums and of the lips. This membrane proceeds backwards before a great

number

number of ſmall muſcles, and is reflected on the tongue, which it entirely envelops. Below that part it forms a fold, which is fixed to the middle of the interior ſurface of the jaw, and conſtitutes the frænum of the tongue.

The membrane which envelops all theſe parts is thin, ſmooth and moiſt; it is thicker at the arch of the palate than on the tongue, where it is interſperſed with papillæ of different ſizes and forms.

The ſmaller papillæ are numerous; of a conical figure, placed cloſe to each other, and terminate in a point: they give to the tongue a velvety appearance.

Theſe papillæ are interſperſed with others leſs numerous, of a larger ſize, and ſhaped like a muſhroom; towards the root of the tongue, there are obſerved from eight to ſixteen larger and ſoftiſh tuberculous papillæ, diſpoſed in one or in two rows in the form of a V, the point of which is turned backwards.

All theſe papillæ appear to be a nervous and vaſcular expanſion; they are in an eſſential manner the ſeat of the *organ of taſte.*

301. The tongue *(gloſſa)* is formed of long muſcular fibres, which terminate in a point on one ſide, and are confounded behind with the fibres of ſeveral other muſcles.

The tongue, by contracting, may be ſhortened; and its point may be bent.

The

The other mufcles, continued with the tongue, are attached to different points of the bones of the cranium, and to a particular bone fufpended in the middle of the mufcles affixed to it: this bone is called the *os hyoides*.

302. The *os hyoides* has the form of a bow; its *body*, or the anterior part of it, is broad; it is articulated on the fides with a thin extended prolongation, the *great horn*, which proceeds directly backwards. Above the articulation of the great horns with the body of the bone are articulated two other prolongations, the *leffer horns*; which are turned upwards, and often remain very fhort.

This bone is fufpended by the mufcles, between the angles of the jaws; it is retained behind by a ligament, which, proceeding from the extremity of the large horns, is attached to the ftyloid apophyfis.

303. Before and on the fides of the os hyoides is attached a thin, flat, quadrilateral mufcle, which afcends before, and proceeds to the fides of the root of the tongue. It draws the root of that organ downwards and backwards, or pulls the os hyoides upwards and forwards. HYO-GLOSSIAN.

304. To the middle of the interior furface of the lower jaw, towards its genian apophyfis, is affixed a broad mufcle, flattened tranfverfely, and of a triangular form; this mufcle is feparated from its fellow before, only by a cellular tiffue: both thefe mufcles

 proceed

proceed downwards and backwards, becoming broader; after which they are confounded together, and their fibres unite to thofe of the tongue. This mufcle can carry the tongue forwards and beyond the mouth, as well as backwards and downwards: it can alfo bend it on itfelf. GENIO-GLOSSIAN.

305. To the ftyloid apophyfis is affixed a fmall mufcle, which proceeds downwards and forwards; it becomes thin and flat, and terminates on the fides of the tongue from its root till towards the tip of it. This mufcle, with its fellow, moves the tongue upwards and backwards. STYLO-GLOSSIAN.

The tongue, which is fixed to the os hyoides, is moved by the mufcles affixed to that bone.

306. On the fides of the interior face of the lower jaw, along an oblique line, is affixed, by an aponeurotic expanfion, a thin broad mufcle, the anterior fhort fibres of which proceed downwards and backwards, the pofterior inwards, and both unite to affix themfelves, by fhort aponeurofes, to the os hyoides: it moves that bone upwards and forwards, and depreffes the jaw. MYLO-HYOIDIAN.

307. To the genian apophyfis is affixed a fmall thin mufcle, which defcends behind, and is inferted before the middle of the os hyoides: it raifes the jaw by carrying it forwards, or depreffes it. GENIO-HYOIDIAN.

308. To

308. To the ſtyloid apophyſis is affixed a thin ſlender muſcle, which deſcends forwards and inwards, and is inſerted on the ſides of the bodies of the os hyoides. Near this point it divides, and ſuffers to paſs through its thickneſs the tendon of another muſcle, the *maſtoido-genian.* It moves the os hyoides upwards and backwards. STYLO-HYOIDIAN.

309. To the upper part of the ſternum behind, and near the clavicle, is affixed a long thin muſcle, which proceeds upwards, approaches its fellow near the larynx, and is inſerted in the inferior edge of the body of the os hyoides, which it lowers. STERNO-HYOIDIAN.

310. On the upper edge of the ſcapula, near the indentation obſerved in it, is inſerted a thin ſlender muſcle, which paſſes behind the clavicle, aſcends on the inſide, and is affixed at the bottom and on the ſide of the body of the os hyoides, which it depreſſes. SCAPULO-HYOIDIAN.

All theſe muſcles render the tongue ſuſceptible of being moved in almoſt every direction.

311. From the lateral parts of the root of the tongue ariſes a ſmall muſcle, which proceeds towards ſeveral others ſituated at the back part of the vault of the palate. The aggregate of theſe muſcles forms, above the tongue, an arch, which conſtitutes the entrance of the alimentary canal: it

it has been diſtinguiſhed by the name of the *velum palati.*

The membrane of the mouth is extended over theſe muſcles, and forms, in the middle of them, a round fungous fold, which terminates in a point, and is ſuſpended from the ſummit of the arch: it is called the *uvula.* The muſcles covered by this membrane extend even into this fold, and move the *uvula.*

The muſcles which form the *velum palati* produce two layers on each ſide, placed one before the other, and ſeparated by a ſpace which contains a gland. Theſe two layers are called the *anterior* and *poſterior pillars.*

312. From the ſides of the root of the tongue ariſes a ſmall muſcle, which proceeds to the anterior pillar of the velum palati: by contracting it leſſens the aperture of the velum. GLOSSO-STAPHYLINE.

313. To the petrous portion of the temporal bone, near the guttural conduit of the ear, is affixed a ſmall round muſcle, which deſcends, becomes broader, and proceeds to the ſubſtance of the velum palati and of the uvula. It raiſes the ſummit of the velum behind, and carries it before the entrance of the noſtrils, which may be then ſhut during the time of deglutition. PETRO-STAPHYLINE.

314. To the baſe of the pterygoid apophyſis is

 attached

attached a thin flat muſcle, which deſcends along its interior wing: it terminates in a tendon, which is reflected around the ſpine of the pterygoid apophyſis; it then proceeds inwards, adheres to an aſperity of the plane portion of the palatiné bone, and unites with its fellow. This muſcle, which is found on the exterior ſide of the preceding, raiſes and extends the velum palati. PTERYGO-STAPHYLINE.

315. To the middle and bottom of the arch of the palate is affixed a ſmall muſcle, which deſcends behind; is confounded with its fellow, and proceeds to the uvula, which it raiſes and ſhortens. PALATO STAPHYLINE.

316. The mouth is continually moiſtened by a viſcous fluid, ſecreted from an indefinite number of glandulous follicles, found in the ſides of that cavity, which pour it out through a great many ſmall pores.

Theſe glands have acquired names from their poſition; ſuch as the palatine, lingual, molar, labial and buccal.

But during maſtication the mouth receives, in great abundance, a leſs viſcous liquor, ſecreted by ſeveral large glands, and which is poured into the mouth through particular ducts.

317. Below the ear, and before the maſtoid apophyſis, is a large gland which appears to be compoſed of lobules, or ſmall glands united into

lobes by a cellular membrane. Each ſmall gland is furniſhed with an excretory tube: theſe tubes unite, and form a duct, which deſcends before, traverſes the *bucco-labian* muſcle, and opens towards the ſecond or third of the ſuperior molar teeth. This gland is called the *parotid*, and its duct the *parotidian* (the *ſalivary of Steno*).

318. The interior ſurface of the maxillary bone contains, near its angles, another round gland, of leſs ſize than the preceding, but of the ſame ſtructure: it has alſo an excretory duct, which paſſes below the *mylo-hyoidian* muſcle, is accompanied with a ſeries of ſmall glands, and opens into the mouth cloſe to the frænum of the tongue. This gland is called the maxillary, and its duct the *inferior ſalivary of Wharton.*

319. Below the tongue is found a ſmall gland, from which proceed a great number of excretory ducts that open on the lower ſide of the mouth. *Sub-lingual gland.*

320. Between the pillars of the velum palati is another ovoid gland, which pours the ſaliva through ſeveral holes. *Tonſillæ (amygdalæ).*

321. *The pharynx.* The mouth has a communication behind with a large cavity, from which it is ſeparated by the velum palati. This cavity (the back part of the mouth, gullet, or pharynx) is continued upwards with the back part of the noſtrils,

and the guttural conduits of the ear; it then proceeds downwards and backwards.

The pharynx exhibits before, in the middle of its paſſage. and below the os hyoides, the entrance of a canal which conducts to the lungs: the *larynx*.

The aperture of the larynx, *glottis*, is ſhut by a ſort of ſemi-circular, cartilaginous, elaſtic valve *(epiglottis)*, affixed before towards the root of the tongue, and which proceeds obliquely upwards.

The epiglottis is depreſſed towards the aperture of the *glottis*, by the paſſage of aliment, the falling back of the tongue, and the elevation of the larynx at the time of deglutition.

The pharynx deſcends behind the larynx, and continues with the œſophagus; it is lined by a ſmooth membrane, furniſhed with a great number of glandulous follicles. Its ſides are formed by different layers of muſcular fibres. The longitudinal fibres are attached ſuperiorly to different points of the baſe of the cranium; in the back part, before the large occipital foramen; on the ſides, to the ſtyloid and pterygoid apophyſes; and before, towards the middle of the interior face of the jaw. Below, the muſcular fibres are affixed to the os hyoides and to the cartilage of the larynx: *thyroid*.

Several layers of theſe fibres are tranſverſe and oblique; they croſs each other behind by a more compact

compact tiſſue, which forms a *median line.* This diſpoſition allows the pharynx to be ſhortened, and to be contracted in every point.

To the ſtyloid apophyſis is affixed a round muſcle, which deſcends and expands over the ſides of the pharynx: it contributes to raiſe that part. STYLO-PHARYNGIAN.

The pharynx reſts againſt the trachelian region of the rachis, on the muſcles which cover it; and is ſeparated from it only by a lax cellular tiſſue, which is never greaſy.

The pharynx becomes narrower at its lower part, which correſponds to about the ſixth vertebra of the neck; it then continues in a ſingle canal, which proceeds to the ſtomach: *the œſophagus.*

322. The *œſophagus* is lined with a mucous membrane, analogous to that of the pharynx: its ſides are formed by two layers of pale muſcular fibres: the exterior, which is thicker, has its fibres longitudinal: thoſe of the interior layer are thinner, and diſpoſed in a circular or ſpiral form: they can ſhorten or contract that cavity.

The œſophagus deſcends a little to the left, before the bodies of the laſt cervical vertebræ; it then penetrates into the breaſt, and inclines gently to the right, along the bodies of the dorſal vertebræ; it then traverſes the diaphragm behind, and terminates in the abdomen by a wide aperture, *the œſophagian,* which is continued with the ſtomach.

 323. The

323. The *ſtomach*, ſomewhat wide at firſt, is contained in the left hypochondre: it is conſiderably dilated, and is folded back on itſelf, forming a large convexity: *the greater curvature:* it then proceeds tranſverſally to the right into the epigaſtric region, where it becomes narrower, and exhibits a ſmall convexity: *the leſſer curvature*; after which it terminates in an aperture inclined downwards and to the right. *Pylorus.*

The ſtomach, therefore, exhibits the form of a cone folded back on itſelf, and ſituated in a tranſverſe, oblique direction below the diaphragm. It has two apertures. One of them, the *œſophagian*, is directed upwards, forwards, and to the left: the other, the *pyloric*, which is ſmaller, is turned downwards, backwards, and to the right. It therefore exhibits two curvatures, from the one orifice to the other: one of theſe, which is ſmall, is turned upwards and backwards; the other, which is larger, is turned downwards and forwards. The two apertures of the ſtomach are very near each other in the fœtus, which renders it, in ſome meaſure, ſpherical. In the ſtate of plenitude it moves upwards: its large curvature is entirely before, and its leſs behind.

The ſtomach is every where covered by a *ſerous* membrane, furniſhed by the peritonæum. The part of this membrane which covers the gaſtric organ before, is united to that which covers it behind,

hind, towards the leſſer and greater curvatures, where theſe membranes are applied one to the other, and form a vaſcular, plaited and adipoſe expanſion. The fold which is towards the ſmall curvature *(leſſer epiploon)* comes from the portion of the peritonæum which covers the liver: that formed towards the large curvature *(the great epiploon)* is very extenſive; it deſcends before the abdomen, and covers a great part of the inteſtines.

When the ſtomach is diſtended by the preſence of aliment, the laminæ of which theſe folds are formed towards the curvatures of the ſtomach ſeparate, and permit that organ to aſſume great amplitude.

Below the peritonæal membrane, the ſides of the ſtomach exhibit two layers of muſcular fibres: the exterior extend from the one aperture to the other; thoſe which are below aſſume a circular and tranſverſe direction.

In the laſt place, the ſtomach exhibits interiorly a thick *mucous* membrane, full of villoſities, which give it a velvety appearance; it has in the inſide folds which diſappear in the ſtate of dilatation.

The ſides of the ſtomach become much thicker towards the pyloric aperture, where the interior membrane forms a thick membranous roll, which contains muſcular fibres in the form of a ring: this roll produces a ſort of *pyloric valvula.*

324. *The inteſtines.* The ſtomach is then continued

tinued with the inteſtinal canal. This canal is twiſted, folded back on itſelf, and is narrow at the top: *ſmall inteſtines:* towards the anal extremity it is larger: the *large inteſtines:* its length is about ſix or ſeven times that of the body.

The firſt part of the inteſtine, *the duodenum,* which is continued with the ſtomach, is ſuſceptible of great dilatation; it deſcribes different curves, and is in part unprovided with a peritonæal membrane. It has one and often two ſmall apertures at the diſtance of ſome inches below the pylorus: this portion proceeds backwards, downwards, and to the right; then aſcends, and continues with a long portion of the inteſtines: the *jejunum* and the *ileum.* Theſe inteſtines form a great number of circumvolutions, and occupy the whole anterior, middle, and lateral part of the abdomen.

The *ſmall* inteſtines are continued with the large inteſtines, firſt by a ſhort thick portion called the *cæcum*; it is ſituated in the right iliac region, and at its entrance is furniſhed with a circular membranous valvula, which oppoſes the return of the fæcal matters: this portion of inteſtine has a lateral *appendix,* the cavity of which, called the *cæcal,* terminates like the finger of a glove: the *cæcum.*

This ſhort portion of inteſtine is continued with one much longer called the *colon:* the latter is of the ſame ſize, and is twiſted around all the ſmall guts: it riſes from the right iliac region, traverſes the

the abdomen, below the ſtomach, deſcends along the left ſide, is reflected on the prælumbo-trochantinian muſcle, and is continued with the laſt part of the inteſtinal canal. The latter, called the *rectum*, is large, ſhort, and upright, and terminates by a muſcle, the annular fibres of which cloſe exactly its aperture. *Interior ſphincter of the anus.*

A thin muſcle is placed in the cellular tiſſue, which lines the anus: it is inſerted in the coccyx, by one of its extremities, and at the other is confounded with the bulbo-urethral or cavernous muſcle: by its action it tends to cloſe the anus. COCCYGIO-ANIAN, *exterior ſphincter.*

A large thin muſcle forms the bottom of the pelvian cavity: it is affixed at the top, behind the pubis, to the upper part of the ſub-pubian hole, and the ſpine of the iſchium; and below to the ſides of the coccyx: it then unites with that on the oppoſite ſide, by an aponeurotic line, and embraces the lateral parts. It elevates the anus. SUB-PUBIO-COCCYGIAN, *elevator of the anus.* The ſtructure of the ſides of the inteſtinal canal is analogous to that of the ſides of the ſtomach. The inteſtines are covered by the ſerous membrane, which envelops all the viſcera of the abdomen: *peritonæum.*

This peritonæal membrane, after having enveloped the inteſtinal canal, is reflected backwards, and forms a double wrinkled, vaſcular, adipoſe expanſion of the breadth of the hand, and much ſhorter

ſhorter than that canal: it is affixed before the bodies of the dorſal and lumbar vertebræ, and thus ſecures the inteſtines. A part of this membranous expanſion retains all the ſmall inteſtines in a bundle in the middle of the abdomen: *meſentery:* the other part confines the large inteſtines around the former: *meſo-colon.* The double membrane of the meſentery is ſuſceptible of being ſeparated near the inteſtines, when the latter acquire more amplitude.

Below the ſerous membrane of the inteſtines is a double layer of very thin muſcular fibres: the exterior longitudinal ones are diſpoſed in ſeparate bands; the interior ones, which are circular, are alſo very thin. The longitudinal layers, which are little ſuſceptible of extenſion, confine the ſides of the canal, and produce thoſe gibboſities which are obſerved in the large inteſtines.

The outſide of the alimentary canal is furniſhed with a mucous membrane, analogous to that of the ſtomach. At the entrance of the duodenum is obſerved one or two ſmall apertures, which pour into the inteſtine the product of the ſecretion of the liver and of the pancreas.

325. The *liver* is a glandulous organ of a conſiderable ſize; it occupies a great part of the abdomen, and is ſituated in the right hypochondre, the epigaſtric region, and a part of the left hypochondre, below the diaphragm, &c. This organ receives

receives the venous blood, which comes from the principal viſcera of the abdomen. The blood by traverſing this gland undergoes important changes; it is freed from thoſe greaſy and albuminous moleculæ which it contained in exceſs: theſe ſubſtances, by their combination with a ſmall quantity of ſoda, form the bile, which proceeds from every point of the liver by a peculiar order of veſſels.

If it be conſidered that the liver is the heavieſt of all the organs, and that the great quantity of venous blood which it continually receives, undergoes in this organ the moſt important changes, it may be readily conceived that a minute deſcription of its vaſcular ſtructure belongs rather to the ſyſtem of circulation than to that of digeſtion. We ſhall, therefore, introduce here only what relates to the excretion of the ſmall quantity of bile produced by the materials taken from the large quantity of blood which paſſes through the liver. The bile is excreted in all points from the hepatic organ by ramifications, rami, and branches, which decreaſing in number, and increaſing in calibre, unite together, and iſſue from its tranſverſe furrow by two or three trunks, which terminate in one duct called the *hepatic*.

The hepatic duct, after proceeding a certain way to the left, communicates with another duct, *the cyſtic*, which is reflected upwards and to the left, at a very acute angle, and proceeds to the gall-bladder.

bladder. Theſe two ducts form, by their union, a larger duct, called the *ductus choledochus*, which proceeds to the left, and opens into the duodenum.

The *cyſtic duct*, which is an inch in length, is terminated by a dilatation that conſtitutes the gall-bladder.

This pyriform veſicle is lodged in a depreſſion of the gaſtric face of the right lobe of the liver; it touches the colon, the commencement of the duodenum, and the pancreas.

The exterior tunic of it is formed by a prolongation of the peritonæum, in every part of it which does not adhere to the liver; the interior ſide is villous, interſperſed with folds, and exhibits all the characters of the *mucous* membranes.

The *ductus choledochus* is a continuation of the hepatic and cyſtic ducts; its length is about three finger-breadths; it deſcends, on the left, before the ſub-hepatic vein; is inſerted obliquely between the tunics of the duodenum; often receives in that part the pancreatic duct; and at length pierces the villous tunic of the inteſtine, two finger-breadths below the pylorus.

The ſtructure of the hepatic, cyſtic, and choledoch ducts is nearly the ſame as that of the gall-bladder.

326. The *bile*, which proceeds from all parts of the liver, runs along the hepatic duct, as far as the ductus choledochus; the latter pours it into the

the duodenum: but when it does not flow into the duodenum, it may flow back by the cyſtic duct, and be depoſited in the gall-bladder, where it acquires more conſiſtence, and aſſumes a darker colour.

The bile is a liquid of a greeniſh yellow colour, fat, and ſoft to the touch, viſcous, exceedingly bitter, miſcible with water like ſoap, and ſoluble in oils, alcohol, and ether.

The chemical compoſition of the bile may be aſcertained by the following mode of analyſis: Pour dilute ſulphuric acid over this animal liquor, and expoſe it to heat. You muſt then obſerve whether precipitation takes place, and whether a ſaline ſubſtance remains in the liquor: the precipitate muſt be ſeparated by filtration.

The liquor, when properly evaporated, will give cryſtals of ſulphate of ſoda. Then treat the precipitate with alcohol, which will diſſolve a part of it: the other is to be ſeparated by the filter. If the alcohol be evaporated, a pure oily matter will be depoſited: the other part of the precipitate, which remains on the filter, is albumen.

Hence it reſults that bile is eſſentially formed of albumen, oil, and ſoda, in a kind of ſaponaceous ſtate.

Different ſalts alſo are found in the bile, in ſmall quantity, and particularly phoſphate of ſoda.

The bile very often produces concretions in the gall-bladder.

327. *Bi-*

327. *Bilious concretions* are ſometimes very numerous; they affect, for the moſt part, a tetraëdral pyramidal form, and, when there are ſeveral, become polyëdra by friction. They are brown, green, or yellow; exceedingly light, and burn, emitting a thick ſmoke.

They affect three modes of compoſition. Some are irregular, and conſiſt of grains united around a nucleus: others are angular, and produced by concentric ſtrata of different denſities, and often very compact. The laſt kind are ovoid, exceedingly hard, covered by a white coating, are brilliant, and appear to be cryſtallized: this kind are inſoluble in alcohol; they are formed of adipocera; the reſt are of the nature of bile.

328. *The ſpleen.* The blood which proceeds to the liver by the ſub-hepatic vein comes in part from the ſpleen; this viſcus, which has an ovoid form, is of a blueiſh red colour. It is placed lengthwiſe in the left hypochondre, and is covered by the peritonæum, the folds of which fix it to the diaphragm, the ſtomach, and the meſocolon.

The ſpleen is convex on the outſide, and ſomewhat concave within, where it exhibits a longitudinal ſciſſure filled with fat. The artery which proceeds to this organ (the left branch of the ſub-gaſtric or cœliac trunk) is very large, twiſted, and penetrates into its ſubſtance near the ſciſſure. The

The venous trunk, which returns from that organ, is united to the mefenteric vein; and both form the fub-hepatic vein, *vena portæ*, which proceeds to the liver.

No other ufe is yet known of the fpleen, than that of conveying all its venous blood to the hepatic organ.

329. The *pancreas* is an oblong gland, very much analogous to the falivary glands. It is placed, in a tranfverfe direction, in the left hypochondre, below the ftomach, between the liver and the fpleen, on the pofterior aperture of the two membranes of the mefo-colon, which cover it before: behind it is enveloped only by cellular tiffue.

The pancreas is of a pale rofe colour, and appears to be formed of lobes enveloped by a cellular membrane. Thefe lobes are an affemblage of lobules and glands indefinitely divided, and are alfo covered by a ftratum of cellular membrane.

Acrofs the middle of the pancreas runs a duct, on the fides of which fome exceedingly fine fecreting ducts terminate. The pancreatic duct proceeds to the right, and opens into the ductus choledochus, or very near it, in the duodenum.

The fluid fecreted by this gland appears to be very analogous to faliva.

30. The *peritonæum*, which, as already faid, envelops the whole vifcera of the abdomen, and the

the ſides of that cavity, forms a common covering. Its ſtructure is ſuch, that anatomiſts compare it to a membranous bag every where ſhut. The cavity of this bag forms the ſpace comprehended between the inteſtines and the ſides of the abdomen. This cavity, the ſides of which are contiguous, contains nothing but ſerous matter.

The exterior face of this bag lines before, and laterally, the interior ſides of the abdomen; and behind it envelops, in its numerous folds, the viſcera contained in that cavity.

The ligaments which fix the viſcera of the abdomen to the neighbouring parts, are, in a great meaſure, only folds of the peritonæum.

SYSTEM OF CIRCULATION.

331. In circulation, the blood, proceeding from a certain point, is conveyed by one order of veſſels to all the parts of the body, and diſtributes to them the materials neceſſary for the different changes which are there continually taking place: it is then conveyed back to the point from which it proceeded, by one or two orders of veſſels.

In this courſe, the blood paſſes either in whole or in part through peculiar organs, which tend in an eſſential manner to maintain it in a proper ſtate of temperature and of liquidity, or to free it from the reſiduums of organization with which it is charged, or in the laſt place to reſtore to it thoſe eſſential materials which it has loſt. All theſe organs neceſſarily compoſe a part of the ſyſtem of circulation.

332. Circulation. In plants and zoophytes no diſtinction is remarked in the order of circulation, or in the veſſels: the fluids ſeem to proceed to the different parts by a kind of ſuction or abſorption.

Inſects have a long dorſal tranſparent veſſel endowed with periſtaltic motion: the relation of this veſſel to the other parts is not known: beſides,

ſides, the tranſparency of all the organs of theſe animals renders it impoſſible to aſcertain their intimate ſtructure, and we are ſtill unacquainted with the nature of their circulation. There are obſerved, however, in theſe animals organs of ſecretion for the bile, ſeminal liquor, &c. which ſeem to be formed of floating vaſcular packets.

In the worm and leech, a dorſal veſſel which performs the office of a heart is obſerved.

In cruſtaceous animals, ſuch as crabs, the monoculus or water-flea, &c. the heart receives the blood which returns from the branchiæ, and diſtributes it to every part of the body; but it is never ſeen to return to the branchiæ.

In the bivalves, the blood proceeds into an auricle, which pours it into a ventricle, whence it iſſues by an aorta.

Muſcles exhibit a very ſingular organization: they have two very large tranſparent auricles, and the inteſtinal canal paſſes through the heart.

In the aplyſia, the blood, which comes from the branchiæ, unites in a vein the ſides of which become arterial. This veſſel then performs the office of an aorta.

Slugs have on each ſide of the body two contractible apertures, which communicate with two pulmonary cavities, over which the veins are ſpread. Theſe cavities terminate in an inteſtinal canal: the blood, after traverſing the pulmonary

organ,

organ, unites in a vein which proceeds into an auricle; whence it paſſes into a ventricle furniſhed with valvulæ; and from this ventricle it iſſues by an aorta, which diſtributes it to all the parts of the animal.

In the ſepia, a large vein divides itſelf into two branches, which proceed to two auricles furniſhed with a valvula. Theſe two auricles are ſeparated, and furniſh an artery which is diſtributed to each branchia. The blood comes from the branchiæ by two veins, which unite in a common trunk; and this trunk proceeds to a ſolitary ventricle, from which the blood iſſues through an arterial aorta.

333. In the different claſſes of animals here mentioned, the blood appears under the form of a ſerous liquid, more or leſs whitiſh, and ſeldom red. It ſeems to return from the different parts in the ſame manner in which it was conveyed thither; that is to ſay, by one order of veſſels. But in the other claſſes of animals, which we are about to examine, the blood is red; it is diſtributed to all the parts by one vaſcular ſyſtem (the arteries), and returns by two orders of veſſels: one of them (the veins) brings the greater part of the blood to a red ſtate; the other, much leſs apparent (the lymphatic veſſels), collects the ſerous reſiduums, and the product of digeſtion which it pours into the veins.

In fiſhes, two venæ cavæ pour the blood into an

an auricle, whence it paffes into a ventricle furnifhed with two femilunar valvulæ (one at its entrance and the other at the place of exit). The blood iffues from this ventricle through an artery which divides itfelf into four branches on each fide. Thefe arteries are diftributed to the branchiæ. Each branchial artery afcends along each lamina of the branchiæ: when it arrives towards the middle of them it divides itfelf into two rami, one on the right and the other on the left: each of thefe rami then divides into two others, one of which defcends, and the other afcends, the whole length of the lamina. The laft branches furnifh a great number of very fhort ones, which proceed acrofs and cover the whole furface of the lamina. The blood returns by veins, which in uniting follow the fame order as the arteries do in dividing. The union of thefe veins forms a large dorfal veffel, which performs the office of an aorta.

In reptiles, the lungs receive only a part of the blood. In animals of this clafs fubject to metamorphofis, fuch as frogs, fyrens, and falamanders, two venæ cavæ pour the blood into an auricle furnifhed with valvulæ, whence it iffues by an artery furnifhed alfo with a valvula. This artery, which divides itfelf, conveys the greater part of the blood to a ventricle; the other part proceeds to the pulmonary organ, from which it returns by the veins to the fame ventricle; and it then iffues from that cavity to diftribute itfelf to all the organs.

In

In the ſtate of tadpole (without paws and lungs) theſe animals have on each ſide of the neck a branchia in the form of a plume, which receives the blood; but as theſe animals increaſe in growth the branchiæ become obſtructed, wither, and drop off along with the tail: at the ſame time the lungs expand, and pulmonary reſpiration takes place.

The tortoiſe has two auricles and two ventricles, which communicate with each other. Three venæ cavæ pour the blood into one auricle, furniſhed with valvulæ, whence it paſſes into a ventricle to be diſtributed to the pulmonary organ: it then returns by veins to an auricle, and paſſes into the ſecond ventricle. This ſecond ventricle has a communication with the former, by an aperture cloſed by a valvula. This aperture correſponds to the arterial aorta, and the arterial blood proceeds directly thither without mixing much with the venous blood, though theſe two ſorts of blood are together in the ſame cavity.

In the mammalia and birds, the blood proceeds to an auricle which pours it into a ventricle furniſhed with valvulæ. From this ventricle it paſſes through the lungs, and returns by veins which convey it to a ſecond auricle, whence it paſſes into a ſecond ventricle provided with valvulæ: it iſſues from this cavity by the aorta, which diſtributes it to the different parts.

In the ſtate of fœtus, the mammalia and birds

 exhibit

exhibit another order of circulation. The blood poured into the pulmonary auricle paſſes, in part, into the aortic auricle, by an aperture furniſhed with a valvula (*foramen ovale*). The remainder of the blood flows into the pulmonary ventricle, whence it iſſues by the artery of the ſame name. At that place a part of the blood paſſes through a duct, which eſtabliſhes a communication between that artery and the aorta (arterial duct); the reſt traverſes the lungs, and returns by the veins. The latter paſſes through the aortic auricle and ventricle, and mixes in the aorta with that which proceeds directly thither through the arterial duct.

The circulation in the fœtus of the mammalia and of birds reſembles that of reptiles, as only a part of the blood paſſes through the lungs.

In cetaceous and amphibious animals, the aperture which forms a communication between the two auricles, cloſes more ſlowly; but at length it always becomes obſtructed, as in the mammalia and birds.

334. It is obſerved in all claſſes of animals, and even in plants, that the nutritive fluid, or the blood, has a temperature peculiar to itſelf. In the greater part of animals this temperature is not much different from that of the medium in which they habitually live; but it is conſtant, and does not directly follow the variations of theſe mediums.

In

In animals with lungs, through which the whole of the blood paſſes, ſuch as the mammalia and birds, the temperature of the blood is much higher than that of the atmoſphere of temperate climates. This temperature, which is about 40 degrees of the centigrade thermometer, varies only a degree or two in the moſt oppoſite latitudes.

335. The principal changes which the blood experiences, during its circulation, take place while it paſſes into the kidneys, the liver, and in particular through the organs of reſpiration.

336. Urinary system. The blood is freed from its exceſs of aqueous parts, and from different ſaline ſubſtances, by means of the kidneys.

All red-blooded animals have kidneys; white-blooded have nothing analogous.

The kidneys are nearly of the ſame relative ſize in all animals; they are however more voluminous in birds.

The renal ſyſtem, in general, conſiſts of one large gland on each ſide. The urine ſecreted from every point of this gland iſſues from it by ſmall ducts, which proceed to a common canal, called the *ureter*, as in fiſhes, reptiles, and birds.

In moſt of the mammalia, the urine, which proceeds from every point of the kidneys, oozes through ſmall funnel-like capſules: ſeveral of theſe capſules unite, and proceed into ſmall com-

mon reſervoirs or baſons, from which the urine afterwards paſſes into the ureter.

The kidney, ſometimes, is compoſed of ſeveral ſmall glands united without reſervoirs, each having its particular ureter; as is the caſe in the bear, otter, and cetaceous animals.

The ureters either convey the urine directly outwards, or pour it into a bladder; from which it afterwards iſſues by a ſecond canal, called the *urethra*.

Birds have no bladder: the ureters proceed into a cavity, common to the excrements and the eggs, *cloaca*; and iſſue through the anus *.

A bladder is found in fiſhes, in reptiles, and in the mammalia. In fiſhes it is ſituated behind the rectum; in reptiles it is placed before, and is ſometimes double, as in frogs: in theſe two claſſes of animals the urine proceeds to the rectum.

In all the mammalia the bladder is placed before the rectum; and the canal of the urethra paſſes through the parts of generation.

337. Hepatic system. The blood, on its paſſage into the liver, is freed from ſeveral ſubſtances, and in particular from fat and albuminous matters which it contains in exceſs.

The liver ſeems to exiſt in inſects under the form of a vaſcular reticulation: it is found in the

* In the oſtrich, the ureter proceeds directly outwards, near the aperture of the ſphincter ani, and behind the cloaca.

mollusca

mollufca and in all vertebral animals. Its fize in general is in the inverfe ratio of that of the organ of refpiration ; which has induced fome to believe that thefe two organs have analogous functions, and that they can, in fome meafure, fupply the place of each other in their action on the blood.

The liver, in general, is exceedingly large in the mollufca ; very voluminous and oily in fifhes, but fmaller in the mammalia and birds. It is obferved in the fœtus of the laft two claffes of animals, that the liver, comparatively fpeaking, is of a confiderable fize, and that the fize decreafes after birth in proportion as the organ of refpiration is expanded.

The liver, in general, is divided, to a greater or lefs depth, into two or more lobes.

The venous blood, proceeding into the hepatic organ, is that which returns from the principal abdominal vifcera by veins that unite into a large trunk, the *fub-hepatic vein* or *vena portæ*. On its paffage through all the abdominal vifcera, which in general are covered with fat, the blood becomes charged with adipofe and albuminous matters, of which it is in part deprived in the liver. The bile, which refults from this particular excretion, becomes afterwards one of the moft powerful agents of digeftion.

The blood, when it has thus paffed through the liver, and been freed from a part of the fubftances

 combined

combined with it in exceſs, returns by numerous veins, which unite and proceed into the vena cava.

338. SYSTEM OF RESPIRATION. It is in the organ of reſpiration, in particular, that the blood undergoes the moſt remarkable changes; it is there that it is at laſt freed from the ſubſtances foreign to its compoſition, and acquires the principles it has loſt by diſtributing itſelf to the different organs. It is in this organ that the blood paſſes completely from the venous to the arterial ſtate, and acquires all the qualities neceſſary to fit it for a new circulation.

The ſyſtem of reſpiration brings the blood conſtantly into relation with the circumambient fluid. There are three ſorts of reſpiratory organs: the tracheæ, branchiæ, and lungs.

339. *Tracheæ.* In the cortical part of vegetables, but ſtill better in the ligneous, are obſerved ſmall thin laminæ, twiſted into a ſpiral form, and lengthened out like a ſpiral ſpring. Theſe tracheæ may be eaſily ſeen on half breaking by flexion a young twig. It has been ſuppoſed that the circumvolutions of theſe laminæ muſt form a hollow cylinder, and that they conſtitute air-veſſels: this hypotheſis is not ſupported by proofs.

Tracheæ, or elaſtic tranſparent filaments, diſpoſed in a ſpiral form and ſuſceptible of being unrolled,

rolled, are obſerved alſo in different parts of inſects.

In ſeveral of theſe animals, ſuch as flies, bees, the cock-chafer, and beetle, are obſerved two holes or wide cells, which end at two reſervoirs: the air which fills theſe reſervoirs paſſes into the tracheæ.

In theſe animals, the tracheæ are ſubdivided, and diſtribute themſelves to every part of the body; they have a brilliant ſilvery appearance, and often produce a wonderful effect on their different organs.

340. *Branchiæ.* Branchiæ are found in the tadpoles of reptiles ſuſceptible of metamorphoſis, aquatic molluſca, and fiſhes.

Reptiles in the ſtate of tadpole have on each ſide branchiæ in the form of a plume: in proportion as the animal expands and acquires perfection, theſe branchiæ become obſtructed, wither, fall off with the tail, and their place is ſupplied by the lungs.

All cruſtaceous animals, from the coleoptera to crabs, have branchiæ in the form of laminæ.

Aphrodite worms have branchiæ in the form of laminæ or of a plume; other inſects have tubes proper for inhaling the air.

In the acephalous molluſca, the branchiæ are of different forms; they are ſituated either around an aperture, which ſerves as a mouth, as in the bivalves,

bivalves, or around the anus as in the doris, or around the body as in the aplyſiæ, &c.

In the gaſteropoda, ſlugs, and ſnails, the branchiæ are ſituated in a large cavity below the neck.

In the cephalopoda, the branchiæ, which conſiſt of laminæ, are placed in a cavity on the ſides of the belly.

In fiſhes, the branchiæ are compoſed of laminæ, the number of which, in general, is four on each ſide. The laminæ are formed of long narrow leaves placed at the ſide of each other, like the teeth of a comb, and are united by a thin membrane to the half of their height. Each lamina is compoſed of cartilaginous pedicles united ſide by ſide, for three fourths of their length.

The laminæ of the branchiæ are ſupported by a ſmall hollow bone, on which reſts the tongue, and which is articulated at the baſis of the cranium.

341. *Lungs*. In ſome *reptiles* the lungs conſiſt only of a large membranous cavity, the inferior face of which is covered by veſſels, as is the caſe in the ſalamander *. But, in general, the lungs of

* The cameleon has only a large plaited pulmonary cavity, which it can ſwell up and diſtend to ſuch a degree, that it conſiderably increaſes the volume of its body: it then becomes tranſparent, and aſſumes different tints. A ſimilar conformation is obſerved in the marbled lizard.

reptiles

reptiles are a ſpongy body, the cells of which are almoſt always viſible to the naked eye. Theſe lungs are incloſed in a ſort of pleura, and float in the common cavity of the trunk, which has no diaphragm. The air penetrates into their lungs by a larynx, without an epiglottis. The aperture of the glottis is narrow in ſerpents, and broad in frogs and toads. The males of the latter have membranous bags, which become filled with air when they emit cries.

The mammalia have on each ſide of the breaſt a lung formed of a very fine ſpongy tiſſue.

The ſanguine veſſels overſpread and expand over the ſides of the ſmall cells of this tiſſue; and the air penetrates into the interior part of them by numerous ramifications of branchial ducts.

Each lung is enveloped and remains free in a membrane (pleura), which adheres to the ſides of the thorax. The two pleuras produce between them a ſpace which lodges the heart, the œſóphagus, the aorta and the thymus.

The air penetrates to the lungs by two bronchial ducts, which are ramified in the inſide: theſe two ducts are the diviſion of the tracheal artery.

The tracheal artery and the bronchiæ are formed of cartilaginous rings, incomplete behind, and united by a membrane. This trachea is continued with the larynx, which is a cartilaginous dilatation.

The

The larynx communicates with the lower part of the pharynx, by an aperture *(glottis)* covered with a cartilaginous lamina (*epiglottis*). This lamina falls down on the glottis, during the paſſage of the aliments; it ſerves alſo to make the air vibrate when it iſſues with force from the lungs, and is the principal cauſe of the ſounds produced by animals.

The larynx, in all the mammalia, is formed of five cartilages, viz. the thyroid, the cricoid, the two arithenoids, and the epiglottis. But in ſome animals of this order it exhibits very remarkable peculiarities, calculated to produce a variety of ſounds *.

In the mammalia, the larynx is generally moved by four or five pairs of muſcles, proper for lengthening or ſhortening the trachea; and for dilating or contracting the trachea and the glottis.

In *birds*, the lungs are much more extenſive; they are not incloſed in a pleura, but adhere to

* In the orang-outang the ventricles of the glottis are pierced with an aperture, which terminates in two membranous bags. Mandrils have a membranous bag, the aperture of which is at the root of the epiglottis. In the howling ape, the os hyoides is ſhaped like an oſſeous box of the ſize of the fiſt. The aſs, at the extremity of each ventricle, has a hole correſponding to a particular bag. The larynx of the ſwine exhibits in its length a deep ſinus. The air expired with force enters into theſe different cavities, and produces different ſounds. The horſe, near the thyroid cartilage, has a triangular membrane, placed in a tranſverſal direction, which by quivering is capable of producing neighing.

the ſides of the thorax by a looſe cellular tiſſue. Theſe lungs communicate with ſeveral membranous bags, ſituated chiefly in the abdomen, which ſeem to be formed by a fold of the peritonæum. They are generally ſix in number, placed longitudinally between the inteſtines and the abdominal viſcera: three alſo are found in the breaſt, and two under the axillæ.

The lungs have a communication with theſe bags by particular apertures; and the bags themſelves are continued with other cavities of leſs ſize, which are in the thighs, the wings, the ſubſtance of the bones of the cranium, in the cavities of the long bones, and even in that of the tubes of the feathers.

In birds, the larynx is compoſed of ſix or four oſſeous pieces: the principal one is analogous to the cricoid cartilage of the mammalia; but they have none which correſpond to the thyroid and arythenoid cartilages: they have alſo no epiglottis. The only function of this larynx is to open and ſhut the aperture of the glottis. The edges of its aperture are furniſhed with cartilaginous points proper for preventing the entrance of the aliments.

The tracheal artery is formed of complete rings: inferiorly the two apertures of its bronchial bifurcation exhibit, on their ſides, a projecting membrane, which in part cloſes them. This moveable membrane performs the office of an epiglottis; it cauſes

caufes the air to vibrate in its paffage, and in this place the found is formed: this apparatus conftitutes the inferior larynx of birds.

The rings of the bronchiæ are incomplete, and vary both in their fize and figure. The inferior larynx of birds, in many of thefe animals, has no proper mufcles: feveral of the latter are furnifhed with offeous or membranous dilatations. Some birds have a mufcle which is inferted in feveral of the half-rings of the bronchia. Others have three pairs of mufcles, as is the cafe with perroquets: in finging-birds and in feveral others there are five pairs. All thefe mufcles are difpofed in fuch a manner as to produce indefinite variations in the dimenfions of the larynx and of the bronchiæ.

342. *In man*, the apparatus of circulation exhibits an auricle, which receives the blood returning from all parts by the veins and the lymphatic veffels. This auricle pours it into a ventricle, which tranfmits the whole of it to the pulmonary organ. The blood then returns to another auricle and a ventricle, from which it is expelled through the aorta, to be diftributed to every point of the organization by means of the arteries.

In this double and fucceffive circulation, through all parts of the body, and through all thofe of the lungs, it is obferved that the blood undergoes very remarkable changes from feveral of the organs.

During

During its arterial circulation, it frees itſelf from its exceſs of heat by the aſſiſtance of the ſkin; and from its exceſs of aqueous parts, by means of the kidneys. On its return through the veins, it is freed from albuminous and adipoſe ſubſtances in the liver. On its paſſage in the lungs, it gives off carbonic acid gas, and takes up oxygen gas. In the laſt place, the ſerous matter, which returns by the lymphatic veſſels, and the product of digeſtion conveyed by the chyliferous veſſels, experience eſſential changes on their paſſage through the lymphatic glands.

The ſyſtem of circulation is thus compoſed, not only of cavities or veſſels which ſerve for conveying the blood to every part of the body, but alſo of organs, which, during its paſſage, make it undergo changes of great importance to the order of the organic functions. In our deſcription of this complex ſyſtem of organs, we ſhall therefore follow the progreſs we have indicated in this ſhort view of the parts of which it is compoſed.

343. The arterial ſyſtem exhibits a ramified expanſion, of which the aorta is the trunk. The ſucceſſive and indefinite ramifications which ſeem to proceed from this trunk, are divided in ſuch a manner, that there is no part of the organization to which they do not penetrate, and to which they do not convey the repairing fluid they contain. The arterial ſyſtem, as it divides, increaſes in capacity;

 and

and the blood, which finds itſelf more at freedom, muſt flow with leſs rapidity as it paſſes from the large arteries into the ſmall ones.

The arteries exhibit frequent anaſtomoſes, and are exceedingly flexuous, eſpecially in the parts ſuſceptible of extenſion, ſuch as the viſcera of the abdomen.

The ſides of the arteries are of a cloſe texture, compact, elaſtic, and little ſuſceptible of extenſion. Their thickneſs is comparatively greater in the ſmall arteries than in the large ones. They ſeem to conſiſt of three tunics, the exterior one of which is cellular, ſoft, and very looſe: the middle one is thicker, and conſiſts of a cloſe yellowiſh tiſſue, little ſuſceptible of extenſion: the interior one is only a very thin and exceedingly ſmooth membrane.

The blood contained in the arteries is ſpumous, florid, and of a bright red colour; it appears to be ſomewhat warmer and lighter than the venous blood, and has not the brown tint of the latter.

The arteries, after dividing and ſubdividing themſelves into exceedingly fine and delicate ramuſculi, which proceed to every part of the organs, at laſt completely diſappear to the eye, even when aſſiſted by the beſt microſcope, ſo that their manner of termination is totally unknown.

344. During the arterial circulation, the exceſs of the heat of the blood is carried off by the ſecre-

tion of the ſkin, reduced into vapour at the ſurface of the body: its exceſs of aqueous parts is expelled, together with ſeveral ſaline ſubſtances, by the urinary ſecretion.

When the blood and all the parts which it moiſtens have too great a quantity of free caloric, ariſing either from a high temperature of the atmoſphere, or from too violent exerciſe of the muſcular ſyſtem, or from ſome peculiar morbific excitement, the cutaneous organ enters into action and ſecretes abundance of perſpirable matter, the evaporation of which at the ſurface of the body lowers the temperature, and always maintains it at about the ſame degree. This abundant perſpiration frees the blood alſo from a quantity of aqueous matters, more or leſs conſiderable; it carries off alſo a little albumen, and ſeveral ſaline ſubſtances.

The ſkin properly ſo called (*dermis, cutis vera*) conſiſts of a thick, cloſe and whitiſh tiſſue; it appears to be produced by the lymphatic and ſanguine veſſels croſſing each other, and by a large quantity of nerves. The nerves expand at the ſurface of the dermis, in very fine papillæ, which ſeem to conſtitute the organ of touching. The dermis adheres to the parts which it covers by a looſe cellular tiſſue.

Above the dermis is found a viſcous, ſoftiſh, and ſomewhat thick ſubſtance, called the mucous tiſ-

ſue (*rete mucoſum, corpus reticulare, mucus malpighianus*). This ſubſtance is of different colours among different nations, and is the cauſe of the diverſity of colour in the ſkin.

The mucous tiſſue is covered by a thin membrane, dry and tranſparent, which conſtitutes the *epidermis* or cuticle. This membrane forms a covering, in ſome meaſure inorganic, proper for ſecuring the parts immediately beneath it from the impreſſion of external bodies.

The ſkin exhibits, in its ſubſtance, ſmall glands, which ſecrete an unctuous humour, with which the whole ſurface of the ſkin is, as it were, varniſhed: theſe glands are more abundamt in the parts furniſhed with hair. In the laſt place, the ſkin contains the bulbs or radicles of the hairs and briſtles, with which theſe different parts are covered. This kind of cutaneous vegetation takes place with much more energy in animals, whoſe bodies are habitually naked; and in them this part of the cutaneous organ, whether compoſed of ſcales, feathers, wool, or hair, ſupplies them with a thick covering, and becomes to them a very important apparatus of excretion.

345. When the blood, by the digeſtion of too large a quantity of drink, has received an exceſs of aqueous parts, it is freed from this exceſs by urinary ſecretion. At the ſame time the kidneys ſecrete different ſaline ſubſtances, and particularly a matter

a matter (*urée*) the preſence of which characterizes the urine of man.

The kidneys are ſituated one on each ſide in the region of the loins. Above them, and behind the peritonæum, is a *glandulous body*, ſhaped like a flattened hemiſphere, of a yellowiſh brown colour, but larger and redder in infancy.

This *ſuper-renal gland* receives a number of veſſels and nerves; it is enveloped by fat, and appears to be compoſed of lobules covered by cellular tiſſue: in the inſide it exhibits a capſule or *cavity* of the ſame form as the gland, and which at the bottom has a ſmall fold in the form of a ridge. The ſides of this cavity are applied to each other; they have the appearance of mucous membranes, and ſecrete a yellowiſh liquid. The uſe of this organ is unknown.

The kidneys are of a reddiſh brown colour; they have pretty nearly the form of a kidney-bean: they are ſmooth in adults; unequal and rough in infants.

They are placed lengthwiſe on the edges of the vertebral column, and correſpond to the extent of the bodies of the laſt two dorſal vertebræ, and the firſt two lumbar. They are covered before by the peritonæum, and reſt behind againſt the ſquare of the loins. The right kidney is ſituated below the liver, and the left below the ſpleen. The concave edge correſponds inwardly, and receives the veſſels and the nerves.

The kidney is immediately enveloped by a ſmooth, compact membrane, which adheres cloſely to it, and which is covered by a thick ſtratum of an adipoſe tiſſue. It receives a very large artery (the renal), which comes from the abdominal aorta. The orifice of the two renal arteries is ſuch, that it can admit the eighth part of the blood which iſſues from the aorta.

The kidney, when cleft lengthwiſe, exhibits a firſt exterior ſtratum (the cortical) of a dark red colour, about two lines in thickneſs, conſiſting of a compact tiſſue. From this tiſſue ariſe, in different points, fibres or ſmall tubes, of a paler red, which converge internally in ſmall bundles, and terminate in the form of *papillæ:* the number of theſe papillæ varies between twelve and eighteen. The exterior compact tiſſue is continued between the bundles of theſe fibres or tubes.

Each of theſe papillæ opens into a membranous and greaſy capſule in the form of a funnel. Theſe funnels unite into ſeveral trunks, which end at a common reſervoir or ſmall baſon.

It appears that the urine is ſecreted in the compact tiſſue of the ſurface of the kidney, that it flows through the tubulated bodies, oozes from the papillæ, and is poured into the particular capſules which proceed to the baſon.

Towards the centre of the interior edge of the kidney, the baſon opens into a very large membranous duct (*ureter*), which deſcends behind the peritonæum

ritonæum along the lumbo-trochantinian muſcle, and proceeds into the leſſer pelvis below, behind, and on the ſides of the bladder.

The ureter is formed of a white, compact, and ſtrong membrane, the interior ſides of which have the appearance of mucous membranes.

The bladder, which is capable of containing a little more than a quart, has a round form, ſomewhat flattened at the bottom; and terminates at the ſummit in a blunt point: in the female it is ſomewhat flattened from before backwards; and in infants is more lengthened from the top downwards. In the male it is ſituated in the leſſer pelvis, between the pubis and the rectum; and in the female between the pubis and the matrix: it is covered at the top and behind by the peritonæum, the expanſion of which ſupplies it, below and behind, with ſome ligaments, by which it is fixed to the neighbouring parts.

The bladder has, at the top, a ligament formed of three cords, which proceed to the navel, raiſing up the peritonæum; two of theſe cords are produced by the obſtructed umbilical arteries; the laſt by a duct which, in the fœtus, proceeded from the bladder to the umbilical cord (*urachus*). This hollow organ ſtill adheres anteriorly to the poſterior part of the pubis, by a compact cellular tiſſue in the form of a ligament.

The ſides of the bladder exhibit outwardly ſeveral layers of muſcular fibres, which croſs each other, and proceed in all directions; theſe fibres are covered behind by the peritonæum, and in the reſt of their extent by a cellular tiſſue. The ureters proceed below, behind, and on the ſides of the bladder; they are diſperſed in the ſubſtance of its ſides, and proceed to the interior part of it.

The interior ſurface of the bladder is formed of a thick, villous membrane, furniſhed with a great number of folds. Below and before, this organ exhibits an aperture (*neck*), the ſides of which are very thick; behind this aperture, the bottom of the bladder has a triangular ſpace (*trigone*) of a cloſer tiſſue, and exceedingly irritable. The interior angle of this trigone is continued in the lower part of the aperture of the neck, by a ſmall round tubercle: the other two correſpond to the apertures of the ureters.

The exterior aperture of the bladder is continued by a very long duct, the *urethra*, which in man runs along the yard: in the female it is ſhorter, and terminates at the ſummit of the vagina.

346. The urine varies very much according to circumſtances, in regard to its quantity, its colour, and its ſmell. In general, it is thicker the more ſlowly it flows, and the longer it has remained in the bladder: that voided immediately after meals,

and

and that, in particular, which refults from an excefs of alcoholifed beverage, is exceedingly clear, and contains fcarcely any thing but water.

The human urine has been carefully analyfed by the modern chemifts. We fhall here give a fhort view of the principal experiments by which its compofition has been afcertained.

This animal liquor always contains *urée*; *uric acid*; an *animal matter* infoluble in alcohol; free *phofphoric acid*; *phofphates* of *lime*, of *foda*, of *ammonia*, and of *magnefia*; *muriates* of *foda* and of *ammonia*: the *fulphates* of *potafh* and of *foda* are alfo fometimes found in it. The urine of children always contains *benzoic acid*. The prefence of the firft ten fubftances is afcertained by the following means:

The prefence of *free phofphoric acid* is afcertained by pouring urine into tincture of turnfole.

If the *phofphate of lime* be feparated by ammonia, this alcali will faturate the free phofphoric acid, and the phofphate of lime will be precipitated.

By evaporating, to the confiftence of fyrup, urine treated by ammonia and then filtered, and afterwards combining it with alcohol, the *urée* and the *muriate of ammonia* will be diffolved. The muriate of ammonia may be decompofed by barytes, and it is then expofed to heat to expel the ammonia. If it be again treated with alcohol, and if the matter be evaporated to drynefs, nothing will be diffolved but the *urée*. Ammonia may be ftill poured

poured over the refiduum, and after the liquor has been filtered it may be concentrated by evaporation. If muriatic or any other acid be then poured into it, the *uric* acid will be precipitated in white flakes, which, when thrown on the filter, affume the form of fcales.

Diffolve in water the refiduum of the former experiment, and after filtrating the liquor fubject it to evaporation. You will then obtain, by cryftallization, *muriate* and *phofphate* of *foda,* combined, in whole or in part, with phofphate of ammonia.

Thefe falts may be obtained alfo by evaporating new urine: in proportion as the evaporation is effected, the liquor becomes turbid by the precipitation of the *phofphate of lime*, becaufe there is extricated ammonia, which faturates the free phofphoric acid that held this falt in folution. If the liquor be then filtered, and the evaporation be continued, the different falts will cryftallize: the *ammoniacal falt* in cubical cryftals, on account of the urée with which it is combined, and the marine falt in octaëdra for the fame reafon; the phofphate of foda, which is combined in whole or in part with the phofphate of ammonia, cryftallizes in rhombuses.

The prefence of the ammoniaco-magnefian phofphate may be afcertained two ways: 1ft, if the urine be left at reft, this *falt* will very often be obferved in white cryftalline laminæ; 2d, if potafh be poured into the urine, *phofphate of lime*

and

and of *magnesia* will be precipitated; by treating this precipitate with acetous acid, acetite of magnesia will be formed; and if this acetite be decomposed by potash, the *magnesia* will be separated.

The *animal matter*, which constantly exists in urine, is insoluble in alcohol: the nature of it has not yet been properly ascertained.

If urine contains also the *sulphates of soda* and of *potash*, they may be obtained in the same manner by crystallization. In the last place, if it contains *benzoic acid*, as is the case with that of children, it must be evaporated almost to the consistence of syrup; if it be then introduced into a retort, with a sufficient quantity of weak muriatic acid, and be exposed to distillation, the *benzoic acid* will pass over into the receiver.

Urine contains also sometimes gelatin, albumen, oxalate of lime and of ammonia; but all these substances are found only very rarely.

In some diseases the urine contains a great deal of gelatin: the presence of it may be ascertained by the insoluble precipitate which it forms with tannin.

What characterizes the urine of man, in an essential manner, is the presence of urée and of the uric acid. These substances are found only in this liquid. Urée produces, in a great measure, all the phænomena which urine exhibits; it crystallizes in laminæ like the muriate of barytes; it combines

combines with the nitric acid, and forms an insoluble compound. When a solution of urée in water is boiled, there is disengaged a very large quantity of ammonia, which arises from the decomposition of that substance.

Urine, by the precipitation of the substances it holds in solution, is susceptible of forming calculous concretions. Urinary calculi are found in the kidneys, along the ureters, in the bladder, and even in the canal of the urethra.

The introduction of a foreign body into the bladder often determines the formation of a calculus, to which it serves as a nucleus.

The different human calculi are formed of the following substances: *phosphate of lime*, *ammoniaco-magnesian phosphate*, *uric acid*, *urate of ammonia*, *oxalate of lime*, *carbonate of lime*, and *silex*; these matters are pure or mixed, and almost always disposed in strata.

Calculi of phosphate of lime, of ammoniaco-magnesian phosphate, and of carbonate of lime, are white; those of phosphate of lime are never crystallized, and form a magma with sulphuric acid; those of ammoniaco-magnesian phosphate are always crystallized in brilliant laminæ, and dissolve completely in sulphuric acid; those of carbonate of lime crystallize generally in close filaments; they dissolve entirely in the nitric and muriatic acids, with which they effervesce: the last kind are very rare.

Calculi

Calculi of urate of ammonia are of a yellowiſh gray colour; they diſſolve completely in potaſh, with a diſengagement of ammonia; thoſe formed by pure uric acid are more or leſs yellow, and diſſolve alſo in potaſh, but without a diſengagement of ammonia.

Calculi of oxalate of lime are always more or leſs black and tuberculous; and hence they have been called *muraux*, on account of their ſuppoſed reſemblance to a mulberry: by calcination they give quick-lime, or carbonate of lime.

Calculi which exhibit ſilex affect alſo the mulberry form; they are ſoluble in acids, give no lime, and are not altered by calcination. Silex has never been found but in two calculi, and even then it was covered, firſt by oxalate of lime, and then by uric acid.

Calculi formed only of phoſphate of lime, or ammoniaco-magneſian phoſphate, are rarely found; theſe two ſalts are almoſt always mixed.

Calculi of pure uric acid are very often found; and ſome of urate of ammonia equally pure; but the uric acid, for the moſt part, is accompanied by urate of ammonia.

It is not uncommon to find calculi of pure oxalate of lime; but this ſalt in general ſerves as a nucleus to the other calculi.

When a calculus is compoſed of phoſphate of lime, ammoniaco-magneſian phoſphate, uric acid, urate

urate of ammonia, and oxalate of lime, theſe matters are almoſt always diſpoſed in the following order: oxalate of lime in the centre, next urate of ammonia, then uric acid, and in the laſt place phoſphate of lime mixed with, and ſometimes covered by, ammoniaco-magneſian phoſphate.

Theſe reſults of the analyſis of urine and human calculi are a very ſhort extract from the moſt ingenious ſeries of experiments ever made on animal ſubſtances. This labour, for which we are indebted to Fourcroy, Vauquelin, and Thenar, while it conveys uſeful information to the medical practitioner in regard to the nature of urinary calculi, will furniſh hints for diſcovering the proper means to prevent the ravage occaſioned by calculous affections. None however but phyſicians who are good chemiſts will be really deſirous to take advantage of theſe means, or can properly employ them.

347. The blood, after having diſtributed itſelf to all the organs by means of numerous arterial ramifications, and their indefinite diviſions, and after having every where conveyed the materials neceſſary for the different ſecretions, and for effecting the continual changes which take place in every part of the organization, returns by two orders of veſſels, the veins and the lymphatics.

The veins bring back the greater part of the blood, and in particular that which has undergone the leaſt change,

change, and which ſtill retains its red colour. The means of the communication which exiſts between the extremities of the arteries and the firſt radicles of the veins cannot be obſerved; they are concealed from us on account of their infinite minuteneſs, and have hitherto eluded our microſcopic reſearches. It is known, however, that under certain circumſtances the blood ſeems to paſs directly from the arteries into the veins, without undergoing any remarkable changes.

The ſides of the veins are much thinner than thoſe of the arteries. Their ſtructure, examined in the large trunks, is compoſed of three tunics, the middle one of which appears to be vaſcular. The venous veſſels are alſo more numerous, larger, and more extenſible, than the arterial: it is eſtimated that the capacity of the veins is to that of the arteries as nine to four. The interior of the veins exhibits membranous folds in the form of valves; theſe valvulous folds, which oppoſe the return of the blood, are for the moſt part diſpoſed in pairs, and are not found in the ſmall veins nor in the large trunks: the veins which convey the blood from the viſcera contained in the large cavities, and thoſe which are ſituated at a conſiderable depth between the muſcles, are alſo unprovided with them. The veins in their progreſs follow a direction contrary to that of the arteries, and are not very flexuous. Their anaſtomoſes are

alſo

alſo leſs frequent: it is to be obſerved, that in uniting they decreaſe in ſize; the blood, which is then more confined, muſt circulate with greater velocity.

The veins which bring back the blood from the inferior limbs and from all the parts of the abdomen unite into a large venous trunk, which aſcends towards the heart (vena cava aſcendens). Thoſe which bring back the blood from the head, from the ſuperior limbs, and from the thorax, unite alſo into a large trunk, which deſcends towards that organ (vena cava deſcendens.) Theſe two large veins open into a ſinus, *auricle*, with the ſmall vein which conveys back the blood from the heart.

348. The lymphatic veſſels are exceedingly thin and tranſparent; their ſides ſeem to be formed of two laminæ, which, notwithſtanding their thinneſs, are remarkably ſtrong. Their radiculæ ariſe at the ſurface of the membranes, and open into all the cellules or cavities by pores or villoſities, which ſeem to poſſeſs a power of ſuction. The lymphatics abſorb the aqueous fluids diſperſed throughout all the tiſſues, and the ſerous reſiduums produced by the changes which are continually effected in every part of the organization. Theſe veſſels are highly contractile, and exhibit frequent anaſtomoſes; in general they accompany the veins; like them, are diſpoſed in two ſtrata, one

one ſuperficial and the other profound, and are furniſhed with valves which prevent the return of their fluid.

The lymphatic veſſels are exceedingly numerous: by their inextricable interſections they produce plexus, and ſeem even to form the whole tiſſue of the white organs.

The lymphatics, after a certain paſſage, meet with ſmall glands, which they enter. The ſerous fluids and the chyle which they carry thither are there aſſimilated, and, having undergone a ſort of digeſtion, iſſue from theſe ſmall glands by larger and leſs numerous veſſels. The lymphatics continue to advance towards the thorax, traverſing the glands which they meet with; and the lymph in theſe glandulous organs acquires new characters of animalization.

The lymphatic glands are ſmall and very numerous; they vary in their form and conſiſtence; they are obſerved more evidently towards the bend of the large articulations, in the abdomen, the neck, and around the organs of ſecretion.

In proportion as the lymphatics unite, and the rami form branches, their abſolute capacity decreaſes, the fluid is more confined, and muſt circulate with more rapidity.

The reſult of the ſucceſſive union of all the lymphatics is two trunks, which diſcharge themſelves into a vein ſituated under the clavicle. Of

thefe two trunks, the largeft, the moft extenfive, and fometimes the only one apparent, arifes in the abdomen, on the left fide of the vertebral column, towards the middle of the lumbar region, where it exhibits fometimes a fort of dilatation (refervoir of the chyle), and receives the lymphatic veffels of the inferior limbs, thofe of the organs contained in the pelvian and abdominal cavities, and thofe of the fides of thefe cavities. This lymphatic trunk traverfes the diaphragm with the aorta, and penetrates into the thorax (thoracic duct): it afcends on the fides of the bodies of the vertebræ, in the fubftance of the pofterior mediaftinum; and when it reaches the cervical region it bends to the left, and opens into the fub-clavian vein of that fide. This thoracic duct receives, in different points of its extent, the lymphatics which proceed from the right fide of the head, the neck, and the breaft, and from the thoracic limb of that fide. When the left thoracic duct exifts alone, it receives the lymphatics of the right fide.

The right lymphatic trunk is obferved on the fide of the laft vertebræ of the neck. This fmall trunk (the brachio-cephalic) receives the lymphatics which return from the right fide of the head, the neck, and the breaft, and thofe of the right thoracic limb: it opens into the fub-clavian vein of that fide.

349. The arterial blood, in diftributing itfelf to every

every part, and traverſing every point of the organization, undergoes a ſort of alteration: it loſes ſome ſubſtances eſſential to its compoſition, and becomes charged with ſeveral foreign matters. It is in this ſtate that it returns by the veins and the lymphatic veſſels.

The lymphatics, in their progreſs, traverſe the numerous lymphatic glands already mentioned. The lymph and the chyle experience in theſe glands a peculiar aſſimilation, and undergo important changes, before they unite with the venous blood.

The venous blood, in its partial paſſage through the liver, begins to be diveſted of its foreign ſubſtances, and is completely freed from them in the lungs: it there acquires thoſe materials which were taken from it, and reſumes the qualities of arterial blood, to ſerve for a new circulation.

We ſhall here deſcribe the different organs through which the venous blood paſſes before it penetrates to the aorta.

350. The veins which bring back the blood from the principal viſcera of the abdomen unite into a large trunk which proceeds into the liver.

The liver is a gland of conſiderable ſize, and of a dark red colour, ſituated in the right hypochondre, the epigaſtric region, and a part of the left hypochondre; below the diaphragm, to which it is contiguous ſuperiorly, and above the ſtomach

and the inteſtines: it is more voluminous towards the right ſide; is ſmooth and convex at the top and before, concave and unequal at the bottom and behind. At the lower part and before it exhibits a ſharp edge, in the middle of which is a ſlight depreſſion that divides it into two lobes, of which that on the right is larger. This gland has alſo a ſmall lobe at the bottom and behind (lobulus Spigelii).

The liver is covered throughout its whole extent by the peritonæum: this membrane is reflected from different points of its ſurface, and its double fold forms ſeveral ligaments, by which it is fixed to the neighbouring parts. One, which is very large, ariſes from above the middle of the convexity of the liver, and proceeds to the navel and the centre of the diaphragm (ſuſpenſor ligament). It receives before, the umbilical vein, which is obſtructed after birth, and becomes ligamentous. The peritonæum produces on the ſides two expanſions, which form two *lateral ligaments*. It adheres alſo behind the diaphragm by the cellular tiſſue (coronary ligament.)

The hepatic organ receives its blood from a ſmall artery (right branch of the cœliac) and a very large vein (ſub-hepatic or vena portæ). The blood of the ſmall artery ſeems deſtined for the particular nouriſhment of the liver: the ligature of this veſſel in animals does not interrupt the ſecretion of the bile.

The

The ſub-hepatic vein or *vena portæ* is formed by two trunks (the ſplenic and meſenteric), which bring back the blood from the ſtomach, the epiploon, the inteſtines, the meſentery, the pancreas, and the ſpleen. This large vein proceeds into the liver towards the middle of its depreſſion, *tranſverſe ſciſſure*, which is obſerved on its concave face, where it forms a large ſinus, and then diſtributes itſelf to the right and the left: it then divides and ſubdivides itſelf indefinitely in the ſubſtance of that viſcus. The diviſions of this vein accompany thoſe of the artery, the nerves of the liver, and the ducts which bring back the bile.

The ſub-hepatic vein is enveloped from its origin by a prolongation of the peritonæum; this prolongation accompanies the three orders of veſſels, as well as the nerves, and forms of them a ſort of common capſule (*capſula Gliſſonii)*, from which proceed very fine membranous partitions interpoſed between theſe parts. The ſub-hepatic vein, with its diviſions, diſcharges the office of an artery to the liver, ſince it furniſhes it with almoſt all the blood it receives: it is obſerved that the ſides of this vein are thick, and that it has no valves in the inſide.

The nerves of the liver (branches of the pneumogaſtric and triſplanchnic) unite and form a plexus (the hepatic), which accompanies the bili-

ary ducts, and the veſſels which carry the blood thither.

The blood is diſtributed throughout the whole ſubſtance of the hepatic organ, where it frees itſelf from the albuminous and oily matters which it contains in exceſs. The combination of theſe ſubſtances with a ſmall quantity of ſoda forms a ſaponaceous liquor, which excretes from every point of the liver, through particular ducts, and is conveyed into the duodenum, where it becomes one of the moſt powerful agents of digeſtion.

The venous blood, after being freed from the materials of the bile, returns by veins and lymphatic veſſels.

The veins (ſub-hepatic) bring back the blood from every part of the liver, purſuing a direction perpendicular to the veſſels which carry it thither: their ſides are thin, and without valves. From the union of their numerous rami ariſe three branches, which proceed from the three lobes of that gland: theſe three veins form a trunk, which proceeds into the vena cava.

The lymphatic veſſels of the liver are very numerous in the ſubſtance of that viſcus, and particularly at its ſurface. Thoſe of the gaſtric ſide unite into ſome trunks, which proceed into glands ſituated near the hepatic ducts: thoſe of the diaphragmatic ſide unite along the ſuſpenſor ligament

ligament of the liver, traverſe the diaphragm, and proceed into the large chyliferous duct (the thoracic).

351. The venous blood, after undergoing ſome changes on its partial paſſage through the liver, and after receiving all the fluids brought by the lymphatic and chyliferous veſſels, unites into two large veins, which proceed into a ſinus called the *ſinus of the venæ cavæ* (pulmonary or right auricle.)

This ſinus is ſituated at the upper part of the heart, on the right, and ſomewhat behind; it is ſhaped like the ſegment of a ſphere, and exhibits a ſmall appendix.

Its interior ſurface is furrowed by carneous pillars, which adhere to its ſides.

At the top and before is the orifice of the ſuperior vena cava; that of the inferior vena cava is ſituated below and behind; it is larger than the former, and furniſhed with a valve ſhaped like a creſcent, which prevents the blood from flowing back: in general this valve is incomplete, and ſeems to be in part torn or pierced: it is more apparent in the fœtus, and directs all the blood of the inferior vena cava towards the foramen ovale. Before this valve is the aperture of the vein of the heart (the coronary), which is alſo furniſhed with a valvular fold.

The ſinus of the venæ cavæ correſponds within to that of the pulmonary veins, from which it is

 ſeparated

ſeparated by a carneous partition: on this partition is obſerved a ſmall oval foſſa, which in the fœtus is a hole of the ſame form; the greateſt diameter of this hole is four or five lines, and it is furniſhed with a ſemilunar valve, which correſponds to the ſinus of the pulmonary veins.

After birth, this valve is preſſed cloſely to the aperture by the blood which arrives in greater abundance in that ſinus from the lungs; it adheres to it, and the foramen ovale is ſoon completely obſtructed: it has however been found open at an advanced age.

The ſinus of the venæ cavæ communicates with the pulmonary ventricle by a round aperture. Its tendinous circumference is furniſhed with a valve, produced by a membrane cut into three triangular portions of unequal ſize, which terminate in a point (valvulæ tricuſpides, triglochines). To theſe membranous portions are attached, by their free edge, tendinous or carneous filaments, which proceed from the ſides of the ventricle. The action of this valve is to prevent the blood from flowing back into the auricle during the contraction of the ventricle.

The pulmonary ventricle has the form of a ſolid triangle; its interior face exhibits a great number of carneous pillars, adherent or free, and of different ſizes. The greater part of theſe pillars are directed from the baſe to the apex, and others croſs the latter in an oblique direction.

The

The pulmonary orifice of the ventricle is furniſhed in its circumference with three ſemilunar valves (ſigmoid). Theſe valves, when dilated, have been compared to three pigeon-baſkets the convex faces of which touch each other: they exactly cloſe the aperture, and prevent the reflux of the blood from the pulmonary artery into the ventricle.

The pulmonary artery, after a ſhort paſſage, divides itſelf into two branches, which proceed to the two lungs. In the fœtus, theſe two branches are very ſmall; but the pulmonary artery has a direct communication with the aorta by a canal. The blood which arrives from the ventricle, being able to penetrate only in ſmall quantity into the lungs compreſſed and not yet dilated by reſpiration, proceeds directly into the aorta by this *arterial canal*; but, after birth, the pulmonary arteries expand; the whole blood paſſes into them; and the arterial canal, which ſlowly becomes obſtructed, firſt towards the aorta, is changed into a ligament during the firſt years of life.

352. The LUNGS are placed in the two cavities of the breaſt, the form of which they nearly retain; they are convex and ſmooth on the outſide, and excavated towards the heart, which they embrace. They are broad; are flat and have ſharp edges below, and are narrower and rounded at the top and behind.

The

The right lung is composed of three lobes, and the left of two. They are of a dark red colour in the fœtus; of a purple red in infancy; become of an ash white colour in adults, and are interspersed with bluеish spots, which with age increase in number and intensity.

In the fœtus, the lungs are close, compact, and heavier than water; but, when they have been distended by air during respiration, they retain a great part of that air after death: they continue light, spongy, and float in water.

The cellules of the lungs (the bronchial) are exceedingly small: the last membranous ramifications of the bronchiæ terminate in the inside of them.

The bronchial ramifications of the two lungs arise from two trunks, produced by the tracheal artery at its termination: the superior aperture of the tracheal artery is the larynx.

The larynx is a cartilaginous dilatation situated at the bottom of the pharynx, and before the œsophagus. The principal cartilage which enters into the formation of it is situated below the os hyoides; it has been compared to a buckler, on which account it is called the *thyroid.* It is broad and round before, and in the middle exhibits a vertical line: it is incomplete behind, and its lateral faces terminate at the top and bottom in angles or *horns,* which are prolonged backwards: the superior ones are thinner and longer.

 Below

Below the thyroid cartilage is another annular cartilage (the cricoid), narrow before and broad behind, which is articulated with the inferior horns of the thyroid.

Above the poſterior edge of the cricoid cartilage, in the ſpace left by the thyroid behind, there are two ſmall triangular cartilages, twiſted ſomewhat round, ſo as to repreſent the portion of a funnel (arytænoid): the broad baſes of them reſt upon and are articulated with the cricoid; their ſummit, which is thin and narrow, is directed inwards.

In the laſt place, the larynx above its ſuperior aperture (glottis) exhibits a cartilage (epiglottis), which is thin, broad and round; its baſe is united before to the os hyoides, and on the ſides to the thyroid and arytænoid cartilages, by lax ligaments; its ſummit falls down behind on the aperture of the glottis, during the paſſage of the aliments. At the *entrance* of that aperture it forms a ſort of pipe, which makes the air vibrate on its paſſage, and produces ſound.

All theſe cartilages are united by ligaments, which concur to form a very flexible cavity: theſe ligaments produce, by their folds in the interior of the larynx, two deep excavations (*lateral ventricles*).

The cartilaginous pieces which form the larynx are moved by means of ſeveral pairs of ſmall muſcles. One extends from the ſuperior edge of the cricoid

cricoid cartilage to the inferior edge of the thyroid, on the lateral parts of thefe cartilages: *crico-thyroidian.*

Another is inferted in the pofterior part of the cricoid cartilage, and is fixed at the bafe of the arytænoid cartilages: *crico-arytænoidian.*

From above the fides of the cricoid cartilage, and behind the thyroid, arifes a mufcle which is inferted before the arytænoid cartilages: *lateral crico-arytænoidian.*

From the interior face of the thyroid cartilage arifes a fmall mufcle, which proceeds backwards and upwards, towards the arytænoid cartilage: *thyro-arytænoidian.*

In the laft place, a fmall fingle mufcle covers the two arytænoidal cartilages behind: *arytænoidian.*

The combined action of thefe mufcles can lengthen or fhorten, dilate or contract the capacity of the larynx, and produce a variation in the aperture of the glottis.

Befides thefe fmall mufcles, which tend to move the different pieces of the larynx, there are two others, which can lower or raife the whole of it. Of thefe mufcles, one is inferted in the interior face of the firft piece of the fternum, below the ftylo-hyoidian, and proceeds to the oblique line obferved on the thyroid cartilage. This mufcle tends to lower the larynx: *fterno-thyroidian.*

Another, of a fmaller fize, is attached on the

thyroid cartilage, above the preceding, and proceeds to the os hyoides. This mufcle can raife the larynx, when the os hyoides is fixed: *hyo-thyroidian.*

The larynx which is lined with a mucous membrane is furrounded by feveral glands: the principal of thefe glands, which is broad and flat, is fituated before the *thyroid* cartilage, by the name of which it is diftinguifhed; before the cricoid and the upper part of the trachea. The particular ufe of the product of its fecretion is not known. A feries of fmall glands is obferved alfo before the arytænoid cartilages, and a fmall glandulous body on the epiglottis.

The larynx is continued inferiorly with the trachea, which defcends before the œfophagus, to the height of the fecond dorfal vertebra.

This conduit is compofed of cartilaginous rings united by loofe intermediate ligaments: their number varies between fixteen and twenty. They are incomplete behind, and the vacuity is filled up by a longitudinal ligament.

The ftructure of the trachea is fuch, that its length and diameter can be eafily varied: the cavity of it is lined, like the larynx, by a mucous membrane furnifhed with fmall glands.

Inferiorly, the trachea is divided into two trunks, which are the commencement of the bronchiæ: the

the ſhorter one proceeds to the right lung, and the other to the left.

In penetrating into the lungs, the bronchiæ are divided into rami, and ſubdivided into ramifications, exceedingly delicate in every point of that organ.

The texture of the bronchiæ is the ſame as that of the trachea; but in proportion as the diameter of theſe conduits decreaſes, the rings of them become irregular, and at length diſappear. The bronchial conduits are then membranous, and terminate in the numerous cells of the lungs. Theſe cells have not a direct communication with each other, but only by the conduits of the bronchiæ.

In the interior part of the lungs, along the bronchial ramifications, are obſerved a great number of ſmall glands, ſituated chiefly at the angles of their diviſions (bronchial glands.)

353. The two diviſions of the pulmonary artery, at their entrance into the lungs, ſubdivide themſelves into three parts on the right, and into two on the left. Theſe arteries accompany the bronchiæ, and follow them by ſubdividing in the ſame manner. Their laſt ramuſculi penetrate into the bronchial cells, expand over the ſides of them, and there anaſtomoſe directly with the capillary extremities of the veins.

The

The pulmonary veins follow alſo the diviſions of the bronchiæ, and bring back the blood from every part of the lungs: the ramuſculi unite to form rami; the rami to form branches; and the branches produce large veins for each lung, which pour the blood into the ſinus: *ſinus of the pulmonary veins* (left auricle or aorta).

354. This ſinus (auricle) is ſmaller than the preceding; it is ſituated at the poſterior and left part of the heart. In the ſtate of dilatation it affects a cubic form, with an indented prolongation at the top and on the outſide: *auricular appendix*. The interior face of it is ſmooth: it exhibits, behind, the orifice of the four pulmonary veins; in the inſide, it correſponds to the ſinus of the venæ cavæ, and in the fœtus exhibits the foramen ovale: at the top and on the outſide is found the cavity of the appendix. Before, the ſinus communicates with the aortic ventricle by an aperture, the circumference of which is tendinous. This aperture is furniſhed behind with a membranous valve, cut into two ſharp-pointed portions (*valvulæ mitrales*), to which are attached tendinous and fleſhy fibres inſerted in the ſides of the ventricle. This valve prevents the blood from flowing back when the ventricle contracts.

The left or aortic ventricle is ſituated before the ſinus of that ſide; and on the left ſide of the pulmonary ventricle it is ſmaller, and of a form analogous

logous to that of the latter; but its ſides are much thicker: its interior face is furniſhed with carneous pillars, like the right ventricle.

At the top and on the right is found the orifice of the aortic artery, which is furniſhed with a triple valve (ſigmoid), ſimilar to that which is found at the entrance of the pulmonary artery.

355. The heart and the lungs are contained in the cavity of the thorax. The interior ſides of this cavity are lined with a membrane, which is reflected on each lung, and forms a particular covering to them, called the *pleura*.

To have a proper idea of the diſpoſition of this membrane, it will be neceſſary to follow it in its different folds.

The pleura, after covering the ſides of the thorax and the diaphragm, is reflected, before, along the middle of the ſternum, with that of the oppoſite ſide, and forms the two laminæ of the anterior mediaſtinum, between which the heart is lodged. When it arrives behind that organ, and before the pulmonary veſſels, it is reflected on itſelf, and covers the interior face of the lungs, and then their exterior face. When it reaches the baſe of that organ, it is united to that of the oppoſite ſide, and again ſeparates to produce the poſterior mediaſtinum. The pleura then continues on the lateral parts of the vertebral column with that which lines the ſides of the thorax.

In

In the anterior mediaſtinum are found the heart and the *thymus gland*; in the poſterior, the aorta, the œſophagus, the thoracic canal, and the præ-lumbo-thoracic vein.

356. The *thymus*, of which we have not yet ſpoken (in the calf it is diſtinguiſhed by the name of *ſweetbread*), is a voluminous gland, which in the fœtus is ſoft and reddiſh; in children it decreaſes and becomes yellow; with age it continues to loſe ſome of its bulk, aſſumes more conſiſtence, and becomes of a dark yellow colour; in old age it diſappears almoſt entirely. In children it ſecretes a milky humour, the excretory ducts of which are not yet known. We are ſtill ignorant with reſpect to the uſe of this organ.

357. The pleura ſeems to be formed of only one membrane; it adheres by a cellular tiſſue to the ſides of the thorax, and to the ſurface of the lungs, which it covers. Its interior ſurface is applied to itſelf without adheſion, by the contact of the lungs with the ſides of the thorax. This ſurface is ſmooth, and ſecretes abundance of ſerous matter, with which it is continually lubricated.

358. The heart is enveloped alſo by a peculiar membrane, called the *pericardium*, thick, and of a compact texture. It is formed of two folds, the exterior of which, after enveloping the heart, is continued on the large veſſels: it adheres at the

 bottom

bottom to the diaphragm, and in the reſt of its extent to the mediaſtinum. The interior fold, when it reaches the large veſſels, is reflected on the heart, and is thus placed in contact with itſelf: its ſmooth ſurface ſecretes abundance of ſerous matter, which continually moiſtens the heart and pericardium.

359. The blood is a red viſcous fluid of a ſaline ſavour. On the firſt view it appears to be compoſed of a limpid fluid, having floating in it red moleculæ, reſpecting the nature of which a great deal has been written. The red globules of the blood have been ſeen under a lenticular form, and pierced with a hole in the middle, &c. It has been judged that they are ſcarcely the eight hundredth part of a line in diameter.

The temperature of the blood is nearly forty degrees of the centigrade thermometer (104° Fahr.). That contained in the arteries is of a bright red colour, and appears to be warmer than that of the veins.

The blood when newly drawn from a vein exhales an aqueous, odorous, and putreſcible vapour; that of the veins ſeems to diſengage azote, and that of the arteries oxygen.

Chemical analyſis of the blood ſhows that it conſiſts of three principal ſubſtances, *fibrous matter*, *albumen*, and *colouring matter*. There are [illegible] found

found in it alſo different ſalts which are pure ſoda, phoſphate of lime, phoſphates of ſoda and of ammonia, and muriates of ſoda and of ammonia.

To analyſe the blood, it muſt firſt be left at reſt; it then ſeparates into two parts, one ſolid, called the *craſſamentum*, or *cake*; and the other liquid, called the *ſerum* or *lymph*.

The craſſamentum is more or leſs red; it contains fibrous matter, colouring matter, and albumen.

If a pound of craſſamentum, wrapped up in a piece of linen, be ſuſpended under the cock of a ciſtern, ſo as to be ſubjected to a continual ſtream of water, it is obſerved that the water gradually carries off the colouring matter, and a part of the albumen; and at the end of twelve or fifteen hours nothing remains but the white fibrous matter.

To ſeparate the colouring matter from the albumen, which is found mixed with the former in the water, the water muſt be boiled; the albumen then coagulates, and carries with it the colouring matter. This matter is then obtained by calcination, mixed only with a ſmall quantity of the phoſphate of lime. The colouring matter, after this proceſs, gives only phoſphate of iron with exceſs of oxide. The waters employed for waſhing loſe their colour by boiling; they retain only a yellowiſh white tinge, and hold nothing in ſolution but a very ſmall quantity of the ſoluble ſalts which, as already ſaid, are found in blood.

 The

The serum, which is of a yellowish white colour, is viscous and perfectly limpid; it turns syrup of violets green, in consequence of the caustic soda which it contains. When nitrate of silver is poured into serum, it produces an abundant flaky precipitate, which dissolves only in part in pure nitric acid: this proves that the precipitate is partly owing to muriate of silver which has been formed. Serum, when mixed with lime water or a soluble calcareous salt, suffers to be precipitated phosphate of lime. In the last place, serum, when heated, forms itself into a mass by the concretion of the albumen.

Serum then is composed of water holding in solution: albumen, soda, phosphates of soda and of ammonia, muriates of soda and of ammonia. This liquor is perfectly analogous to the white of an egg.

Though the lymph has not yet been well analysed, it is however known that it has a great analogy to the blood, and none to milk: it separates spontaneously into a serous part and a small curd: the latter contains fibrous matter.

360. The blood, in returning from every part of the lungs, is collected by four veins which pour it into a sinus: *sinus of the pulmonary veins* (left or aortic auricle).

From this sinus it passes into the left ventricle, and is propelled thence into the aorta.

The

The aorta in its paſſage furniſhes a very great number of arterial branches, the ſubdiviſions of which are diſtributed to every part.

On its iſſuing from the heart, it gives out, on the right and left, the ſmall cardiac artery (*coronary*), which is reflected on that organ, and is diſtributed to the ventricle and ſinus belonging to its ſide. Theſe two arteries penetrate the whole ſubſtance of the heart, and anaſtomoſe in ſeveral places.

At the ſummit of its curve, the aorta furniſhes two large branches on each ſide: it furniſhes them directly from the left ſide; but from the right ſide gives out in general only one large branch, which is divided.

Of theſe two branches, one is diſtributed to the head, *the cephalic*, and the other to the thoracic member: *the brachial.*

361. THE CEPHALIC (*primitive carotid artery*) aſcends obliquely without, on the ſides of the tracheal artery, and at the height of the larynx is divided into two branches.

Of theſe two branches, one is diſtributed to the neck, the face, and the exterior part of the cranium, *the maxillo-facial*; the other, traverſing the temporal bone, proceeds to the brain: *anterior cerebral.*

362. THE MAXILLO-FACIAL (*exterior carotid artery*) aſcends on the ſides of the neck as far as the neck of the condyle of the maxillary bone;

bone; and in its paſſage furniſhes eight principal branches.

The firſt ariſes near the origin of the maxillo-facial, and deſcends, within and before, towards the ſummit of the thyroid gland, on which it expands: a ramus penetrates the larynx, *the laryngian*, between the os hyoides and the cricoid cartilage, another proceeds into the interval which ſeparates the cricoid and thyroid cartilages. This artery, in its paſſage, diſtributes itſelf to the neighbouring parts, and exhibits frequent anaſtomoſes: *the ſuperior thyroidian* *.

The ſecond iſſues above the preceding; it proceeds inwards, towards the os hyoides, paſſes between the hyo-gloſſian and the genio-gloſſian muſcles, diſtributing itſelf to the muſcles attached to that bone; where it divides: one part paſſes between the genio-gloſſian and the mylo-hyoidian muſcles, and proceeds to the root of the tongue, where it advances in a ſerpentine direction, below and on the ſides of that organ, as far as the point of it. The other is directed towards the back of the tongue, and expands at the root of it: *the lingual*. This artery furniſhes the *ſub-lingual*, the *ſuper-lingual*, and a *hyoidian ramus*.

The third is obſerved below the lingual. It is ſmall, aſcends on the ſides, and a little behind the pharynx,

* We ſhall not mention the numerous varieties obſerved in the origin and diſtribution of the arteries, we ſhall exhibit only the moſt conſtant ſtate.

pharynx, and proceeds to the pharynx and the guttural conduit of the ear, diſtributing itſelf to the neighbouring parts: a ramus penetrates into the cranium, through the poſterior foramen lacerum, and conſtitutes the poſterior meningian: *inferior pharyngian.*

The fourth ariſes above the lingual. It aſcends along the ſuperior part of the pharynx, and paſſes over the maxillary gland, near the angle of the jaw. In its paſſage, it furniſhes the muſculo-palatine, the tonſillary, and the ſub-maxillary. It proceeds before, along the interior face of that bone, is then reflected outwards, aſcends on its exterior face, near the anterior edge of the zygomato-maxillian, and proceeds to the commiſſura of the lips, after giving out the inferior labial. In that place this artery furniſhes two rami, which expand in the thickneſs of the lips; it then aſcends along the cheek, on the ſides of the noſe, at the ſummit of which it terminates, anaſtomoſing with the ſub-orbitar: *the labial.*

The *labial,* in this long paſſage, furniſhes the *muſculo-palatine*, the *ſub-maxillary*, the *tonſillary*, the *inferior labial*, the two *labial coronary*, and ſome rami.

The fifth iſſues from the maxillo-facial, almoſt oppoſite to the lingual. It aſcends obliquely behind, under the ſterno-, cervico-, and trachelo-maſtoidian muſcles; paſſes between the maſtoid apophyſis and the tranſverſe apophyſis of the atlas,

 and

and afcends under the integuments as far as the occiput, where it expands in numerous rami: *the occipital.*

The fixth, which is very fmall, arifes in the fubftance of the parotid gland. It proceeds backwards, above that gland, as far as the maftoid apophyfis, where it furnifhes a ramus, which penetrates into the ear by the ftylo-maftoidian foramen (aqueduct of Fallopius), and diftributes itfelf in the infide of that organ. This artery then divides on the fides of the maftoid apophyfis: a branch proceeds before the ear, and another on the occiput: *pofterior auricular.* This artery gives the *ftylo-maftoidian*, the *tympanic*, and fome mufcular and cutaneous rami.

The maxillo-facial, at its termination behind the neck of the condyle of the jaw, divides into two branches, which are the laft furnifhed by this artery.

The feventh continues in the direction of the maxillo-facial. At its origin it gives out a branch, which proceeds, before, on the parotid gland, the zygomato-maxillian, the falival duct of Steno, and as far as the palpebralian mufcle. The body of this artery then continues under the parotid gland, paffes between the meatus auditorius, where it throws out a ramus to the anterior part of the ear and the condyle of the jaw: it then afcends behind the zygomatic arch, above the temporo-

poro-maxillian mufcle, in the fubftance of which it fends out a branch, and terminates in two rami, one of which expands on the forehead, and the other on the fides of the head: *the temporal.* This artery furnifhes the *anterior auricular*, the *fub-zygomatic*, and the *fuperficial temporals.*

In the laft place, the eighth rifes towards the middle of the branch of the jaw-bone. It afcends along that bone, and the fmall pterygo-maxillian, and proceeds to the fummit of the zygomatic foffa, towards the fpheno-maxillary fiffure: *the maxillo-buccal.*

In its paffage, this artery furnifhes feveral branches:

a. The firft proceeds within, under the fmall pterygo-maxillian mufcle, and penetrates into the cranium through the fpheno-fpinous foramen, where it gives out fome ramufculi, and divides into two rami, which expand on the meninx, and are lodged in the furrows obferved on the fides of the interior part of the cranium: *middle meningian.*

b. Another defcends anteriorly between the great pterygo-maxillian and the branch of the jaw; and proceeds in the dentary canal: the *maxillo-dentary.* Before it enters this canal, this artery furnifhes a ramus to the mylo-hyoidian and the membrane of the mouth. It then paffes through the dentary canal, giving out ramufculi which enter the alveoli of

of the dentes molares. When it reaches the hole of the chin, it furnishes another small twig, which penetrates into the alveoli of the canine and incisor teeth: it then issues from that hole, and distributes itself to the muscles of the lower lip, anastomosing with the labial.

c. A branch passes under the small pterygo-maxillian muscle, to which it distributes itself, as well as to the great pterygo-maxillian: *the pterygoidian.*

d. Two branches are distributed chiefly in the bottom of the temporal fossæ: *the profound temporals.* One arises below the zygomatic arch, passes before the small pterygo-maxillian muscle, and gives out rami, which expand on the temporo-maxillian. The other proceeds in the furrows of the temporal fossa, below the temporo-maxillian. It generally gives out a ramus which passes before the condyle of the jaw, and is distributed to the zygomato-maxillian: the *masseterine.* These arteries anastomose with the superficial temporals.

e. The maxillo-buccal, before it penetrates to the bottom of the zygomatic fossa, furnishes also a branch which descends anteriorly on the maxillary bone: *super-maxillary.* It furnishes ramusculi which penetrate into the maxillary sinuses, and to the roots of the upper dentes molares: it then loses itself in the bucco-labian mus-

cle,

cle, the membrane of the mouth, the neighbouring integuments, and anaſtomoſes with the labial and the ſub-orbitar.

f. The maxillo-buccal, when it reaches the bottom of the zygomatic foſſa, gives out a branch, which penetrates into the ſub-orbitar canal: *the ſub-orbitar.* Before it iſſues from this canal, it furniſhes a ramus, which paſſes through the dentary canal, and diſtributes itſelf to the canine tooth and the inciſors. It then iſſues through the inferior orbitar hole, and diſtributes itſelf to the muſcles of the noſe and the lips, preſenting frequent anaſtomoſes. In its paſſage it ſends out ramuſculi, which penetrate into the orbit and the maxillary ſinus.

g. It then ſends out two rami, one of which paſſes through the pterygoidian canal, and the other through the pterygo-palatine foramen. Both theſe rami are diſtributed to the ſummit of the pharynx and the guttural conduit of the ear: *ſuperior pharyngian.*

h. In the laſt place, the maxillo-buccal furniſhes two rami, one of which deſcends along the poſterior palatine canal, and diſtributes itſelf to the palate: the other paſſes through the ſpheno-palatine foramen, penetrates into the naſal foſſæ, and divides into ſeveral ramuſculi, which are diſtributed on the ſides of that cavity: *palatine* and *pterygo-palatine.*

363. THE ANTERIOR CEREBRAL, *interior carotid,*

tid, is larger in infancy than the maxillo-facial: in adult age it becomes equal to it.

This artery aſcends on the ſides of the larynx and of the vertebral canal; it proceeds as far as the baſe of the cranium, making ſeveral inflections, without giving any rami, and penetrates into the cranium through the winding canal near the petrous portion of the os temporale. When it reaches that cavity, it paſſes on the ſide of the body of the os ſphenoides; is then reflected upwards, turns round in the notch of the anterior clinoid apophyſis, and traverſes the meninx.

The anterior cerebral, immediately after traverſing this membrane, gives out a branch, which enters the optic hole, and is diſtributed to the orbit: the *orbitar*.

The ophthalmic artery penetrates into the orbit, below and on the exterior ſide of the ocular nerve, around which it turns; it paſſes below the ſuperior muſcle of the eye, and proceeds towards the interior ſide of that cavity.

In this ſhort paſſage it furniſhes ſeveral branches, namely:

a. The *lacrymal*, which advances along the exterior ſide of the orbit, is diſtributed to the exterior muſcle of the eye, the orbito-palpebralian, the lacrymal gland, and the upper eye-lid. A ramus even traverſes the os jugale, and expands on the cheek.

 b. The

b. The *ſub-irian* branches, which pierce the ſclerotica in different places: they proceed between that membrane and the choroid, as far as the ciliar ring *(ligamentum ciliare)*, where they are ſub-divided into a great number of capillary veſſels, which form anaſtomotic circles, exceedingly delicate, around the large and ſmall circumference of the iris.

c. The two *ethmoidal* branches, which advance inwards, paſs over the lobe of the eye, penetrate into the two interior orbitar holes, enter the cranium, and are reflected in the ethmoidal cells, through the crebriform plate of the os ethmoides.

d. The *central of the retina*, which penetrates into the optic nerve before it enters the orbit. This artery advances into the centre of that nerve, as far as the retina, on which it expands.

e. The *muſcular*, which gives out two rami: one of theſe, which is larger and conſtant, is diſtributed to the inferior and lateral muſcles of the eye; the other proceeds into the ſuperior, the interior, and the great oblique muſcles of the eye.

f. The two *palpebralian:* theſe are directed towards the interior angle of the orbit, from which they are diſtributed to both eyelids, furniſhing ramuſculi to the neighbouring parts.

g. In the laſt place, the orbitar furniſhes alſo ſome rami, which are diſtributed to the eyebrows, the forehead (the frontal), and to the noſe

(the

(the nafal), and terminates by anaftomofing with the labial.

The anterior cerebral artery, after having pierced the dura mater, and furnifhed the orbitar, proceeds backwards under the brain, and then gives out a *communicating* branch, which anaftomofes with the pofterior cerebral. This fmall and pretty long branch furnifhes, in its paffage, ramufculi to the furrounding parts, and then fends out a ramus which is diftributed to the chòroid plexus.

The anterior cerebral artery is then divided into two branches. The fmaller proceeds before: the *anterior lobar*; the other proceeds on the fide, between the anterior and middle lobes of the brain: *middle lobar*.

The *anterior lobar* is reflected forwards, below the mefolobe, and by a fhort tranfverfe branch communicates near its origin with its fellow. This artery, when it reaches the anterior part of the mefolobe, afcends before the brain, and is reflected on its furface. In this whole paffage it furnifhes numerous ramifications, which expand on the meningine, between all the anfractuofities of the brain, from which they penetrate into the interior parts of that organ.

The *middle lobar* takes a lateral direction below the brain. It paffes between its anterior and middle lobes, and divides into feveral branches, which continue to advance between thefe parts, furnifh-

ing

ing numerous rami to the choroid plexus, the meningine, and the neighbouring parts of the brain. These branches are then subdivided, and expand over the meningine, in the numerous folds which it forms on the lateral parts of the encephatic organ, and lose themselves in the interior of that organ.

364. THE BRACHIAL ARTERY extends from the aorta to the bending of the arm.

To facilitate the description of this artery, its extent is divided into three parts: 1st, that which is under the clavicle (sub-clavian); 2d, that which is under the arm-pit (axillary); 3d, that which corresponds to the arm (humeral).

365. THE SUB-CLAVIAN furnishes, in general, six branches:

The 1st proceeds to the brain, *the posterior cerebral* (vertebral); it rises along the neck, accompanying the inferior thyroidian, then enters the canal produced by the holes of the transverse apophyses of the vertebræ of the neck, and proceeds as far as the great occipital foramen, making several inflexions, especially at the top. In this passage, it sends out several rami to the vertebral canal and to the neighbouring muscles.

When it enters the cranium, it proceeds anteriorly on the sides of the rachidian prolongation, and gives out a great number of small rami, one of which is distributed to the posterior part of the meninx:

meninx: *the occipito-meningian:* two others defcend, one before and the other behind that prolongation. The anterior extends as far as its extremity; the pofterior terminates towards the lumbar region: *anterior and pofterior median of the rachis* (anterior and pofterior fpinals).

The pofterior cerebral artery then fends out a large ramus, which is diftributed on the inferior face of the cerebellum: *inferior great cerebellous.*

The two pofterior cerebral arteries then unite and form a trunk, which advances over the whole length of the mefencephalon: *the mefencephalic* (bafiliar); this trunk furnifhes two fmall rami, one behind, *inferior fmall cerebellous*; and the other before, near its termination: *fmall fuperior cerebellous.* They diftribute themfelves to the bafe of the mefencephalon and of the cerebellum.

The mefencephalic trunk then divides into two branches, *the pofterior lobar*, which proceed on the fides. Each firft furnifhes a *communicating* ramus, which proceeds to the anterior cerebral artery and fome other fmall rami. This artery then divides, and expands over the pofterior lobes of the brain, diftributing itfelf in its numerous anfractuofities.

It is to be obferved, that the brain receives a large quantity of blood, fince the calibre of the four cerebral trunks has been eftimated at a fixth part of that of the aorta. This blood circulates in thefe veffels, forming at the bafe of the cranium

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an anaſtomotic circle, in ſuch a manner that it would be poſſible to tie any one of the cerebral arteries without the circulation of the blood in the brain being interrupted.

The ſecond deſcends into the breaſt, proceeds over the cartilages of the ribs, near the ſternum, between the pleura and the inter-coſtian muſcles. Between each inter-coſtal ſpace it gives out two rami, which traverſe the inter-coſtian muſcles, thoſe above the breaſt, and loſe themſelves in the mammellæ. It diſtributes itſelf alſo to the thymus gland, the mediaſtinum and the diaphragm. This artery then deſcends towards the bottom of the breaſt, furniſhes a ramus to the ſternal appendix, and ſome others which are loſt in the ſubſtance of the muſcles of the abdomen, anaſtomoſing with the *epigaſtric* and the *ſub-ſternal* (interior mammillary). This artery furniſhes *mediaſtine*, *ſub-mammillary*, *inter-coſtal*, and *ſuper-diaphragmatic* rami, and often a *thymic* and a *bronchial* ramus.

The third ariſes oppoſite to the ſub-ſternal, and aſcends before and on the ſides of the neck, furniſhing a ramus to the muſcles of that part: *aſcending cervical.* It then paſſes under the cephalic, proceeds to the thyroid gland, and penetrates its ſubſtance. It there anaſtomoſes with rami of that of the oppoſite ſide, and of the ſuperior thyroidian. This artery diſtributes itſelf alſo to the

 œſophagus,

œſophagus, the larynx, and as far as the bottom of the pharynx: *inferior thyroidian.*

The fourth ariſes, for the moſt part, on the exterior ſide of the thyroidian. It proceeds upwards on the ſides of the neck, paſſes between the tranſverſe apophyſis of the laſt cervical vertebra, and that of the firſt of the back, and aſcends obliquely towards the occiput, furniſhing rami to the muſcles over which it paſſes: *trachelo-cervical* (poſterior cervical.)

The fifth, *trachelo-ſcapular*, often forms two branches at its origin: one of theſe proceeds outwards and downwards, under the clavicle, and gives out ſeveral rami to the neighbouring parts. When it reaches the ſuperior edge of the ſcapula, it paſſes under the ſuperior ſuper-ſcapulo-trochiterian, glides under the acromion apophyſis, and loſes itſelf in the inferior ſuper-ſcapulo-trochiterian muſcle: *ſuperior ſcapular.*

The other, which is larger, takes an oblique direction upwards and outwards, under the ſterno-maſtoidian muſcle, where it gives out a ramus which loſes itſelf on the ſides of the neck. It then divides into two branches: the firſt proceeds upwards, and diſtributes itſelf between the dorſo-ſuper-acromian and the trachelo-ſcapulian muſcle: the ſecond proceeds towards the ſuperior edge of the ſcapula, paſſing under the dorſo-ſcapulian muſcle; it then

deſcends

defcends along the pofterior edge of that bone, and divides itfelf, near its inferior angle, into feveral rami, which lofe themfelves in the fub-fcapulo-trochinian, the dorfo-fcapulian, and the cofto-fcapulian mufcles: *the tranfverfe cervical.*

The fixth iffues from below the exterior extremity of the fub-clavian. It defcends before the neck of the firft rib, often of the fecond, and fometimes of the third, and furnifhes feveral rami. Some of thefe are directed backwards, pafs over the fides of the vertebræ, and lofe themfelves in the mufcles of the neck and the back. The reft proceed outwards, along the inferior edge of the ribs, between the inter-coftal mufcles: fome rami are diftributed to the œfophagus and the bronchiæ: *fuperior inter-coftal.*

366. THE AXILLARY is a continuation of the fub-clavian. It proceeds outwards, forming an arc in the hollow of the arm-pit: it extends from the firft rib to the point where the large dorfal mufcle is attached.

In this paffage it furnifhes five principal branches, the diftribution of which is pretty conftant; but they vary a great deal with refpect to their origin, as feveral of thefe branches often arife from a common trunk.

The firft arifes before and in the middle of the axillary. It then immediately divides itfelf into

 feveral

ſeveral rami, which proceed to and expand between the ſterno-humerian and the coſto-coracoidian muſcles: *ſterno-thoracic* (ſuperior thoracic.)

The ſecond iſſues cloſe to the preceding. It deſcends below the ſterno-humerian muſcle, and divides into ſeveral rami, which are diſtributed to the coſto-ſcapulian muſcle, the inter-coſtians, and the mammilla: *coſto-thoracic* (inferior thoracic).

The third ariſes near the preceding ones. It paſſes over the coſto-coracoidian muſcle, and furniſhes ſeveral rami, which are loſt in the ſterno-humerian and coſto-clavian muſcles; it then continues between the ſterno-humerian and the ſub-acromio-humerian muſcles, and in this paſſage furniſhes a ramus, which expands on the articulation of the humerus with the ſcapula: *the ſuper-ſcapular* (acromial).

The fourth deſcends poſteriorly, below the point where the ſub-ſcapulo-trochinian muſcle is attached, and furniſhes ſome ſmall rami to that muſcle, and to the cellular tiſſue of the arm-pit: it then divides into two branches: the inferior branch, which is ſmaller, *inferior ſcapular*, follows the inferior edge of the ſub-ſcapulo-trochinian muſcle, and loſes itſelf in the coſto-ſcapulian, the lumbo-humerian, and the ſcapulo-humerian.

The other, which is ſtronger, *exterior ſcapular*, is directed backwards, between the ſcapulo-humerian and the inferior ſuper-ſcapulo-trochiterian

muſcles,

mufcles, and divides into two rami. One of thefe rami paffes over the anterior edge of the fcapula, and lofes itfelf in the inferior fuper-fcapulo-trochiterian mufcle, and another fmaller is diftributed to the fub-fcapulo-trochinian: *fub-fcapular* (common fcapular).

The fifth iffues from below the head of the humerus. It is often divided, at its origin, into two branches: one, the *anterior circumflex*, paffes under the coraco-humerian, and the fhort portion of the fcapulo-olecranian mufcle, and expands before and around the articulation of the fhoulder. The other, which is much larger, the *pofterior circumflex*, paffes behind the humerus, between the fcapulo-humerian mufcle and the inferior fuper-fcapulo-trochiterian, below the fub-acromio-humerian; gives out a great number of rami, and lofes itfelf in turning round before and below the head of that bone: *fcapulo-humeral.*

367. THE HUMERAL ARTERY is a continuation of the axillary; it extends from the middle of the hollow of the arm-pit, as far as the middle of the bending of the arm. In this paffage it furnifhes above, towards the upper third of the humerus, a very large branch, the *exterior collateral*, which proceeds outwards, between the humero-cubitian and the fcapulo-olecranian mufcle, and divides itfelf into two branches. One of thefe branches diftributes itfelf in the fubftance of the fcapulo-

ſcapulo-olecranian; the other, which is ſtronger, turns round behind the middle of the humerus, and deſcends along the exterior ſide of the arm, between the humero-ſuper-radian and the exterior portion of the ſcapulo-olecranian: it terminates around the articulation, anaſtomoſing with the radial recurrent.

Below this collateral branch ariſes another, the *interior collateral*, which deſcends along the interior ſide of the arm, before the ſcapulo-olecranian muſcle, and as far as the articulation.

The humeral artery then continues before the arm, along the interior edge of the ſcapulo-olecranian muſcle, and before the humero-cubitian, giving out to them frequent rami: *the muſcular of the arm.*

In the laſt place, the humeral artery gives out near the articulation of the elbow two rami, one of which proceeding towards the epicondyle diſtributes itſelf to the neighbouring muſcles, and anaſtomoſes with the interior collateral and the cubital recurrent. The other proceeds towards the epitrochlea, and is diſtributed in the ſame manner as the interior: *collaterals of the articulation of the elbow.*

At the bending of the arm the humeral artery divides into two branches, one of which follows the *radial* edge of the fore-arm, and the other its *cubital* edge.

368. The

368. THE RADIAL ARTERY extends along the anterior and exterior face of the fore-arm, as far as the extremity of a part of the fingers. Near its origin it furniſhes a branch, which is reflected towards the epicondyle, *recurrent of the epicondyle*, and is diſtributed to the muſcles attached to that part, anaſtomoſing with the exterior collateral of the arm. In its paſſage along the exterior edge of the fore-arm, the radial artery furniſhes ſeveral rami to the neighbouring muſcles: *muſcular of the fore-arm.*

Near the articulation of the wriſt, this artery divides into two branches, after giving out a ſmall ramus before that articulation. One of theſe branches, the *radio-palmaris*, paſſes before the annular ligament of the carpus, gives out a ramus to the muſcles of the thumb, and proceeds towards the palm of the hand. It there furniſhes an artery, which anaſtomoſes with the cubital arch, and then terminates in two rami: one of theſe loſes itſelf on the radial ſide of the thumb; the other deſcends into the interval between the thumb and the index finger, and expands along the correſponding edges of theſe two fingers.

The other branch, furniſhed by the radial artery at its termination, proceeds to the exterior ſide of the articulation, the *radio-ſuper-palmaris*; it gives out a ramus which proceeds in a tranſverſe direction on the carpus, *dorſal of the carpus*, and an-

ther which proceeds to the radial ſide of the thumb.

The radial artery, when it reaches the interval between the two firſt bones of the metacarpus, ſeparates into three branches. *One* of theſe branches glides in the ſubſtance of the metacarpo-phalangian muſcle of the thumb; paſſes along the firſt bone of the metacarpus, and divides into two branches, which are diſtributed on the ſides of the thumb. The *ſecond* paſſes over the firſt dorſal inter-oſſeous muſcle, along the radial edge of the ſecond bone of the metacarpus. The *third*, which is much larger, advances between the carpian extremities of the two firſt bones of the metacarpus: it turns round in the palm of the hand, and unites itſelf to a branch of the cubital to form the profound palmary arch. This arch furniſhes, 1ſt, rami which are reflected before the carpus, to the ligaments of that part and to the muſcles of the thumb; 2d, four rami which paſs before the inter-oſſeous muſcles, to which they diſtribute themſelves as well as to the lumbricals, and terminate towards the heads of the bones of the metacarpus, anaſtomoſing with the digital arteries; 3d, three rami, which pierce the ſecond, third, and fourth dorſal inter-oſſeous muſcles; diſtribute themſelves to the ſuper-palmary face, and each divide into two ramuſculi, which loſe themſelves on the ſides of the laſt four fingers.

369. The

369. THE CUBITAL ARTERY, which is larger than the radial, defcends before, along the cubital edge of the fore-arm, as far as the fingers. Near its origin it gives out two branches, one of which paffes before the epitrochlea, diftributes itfelf to the neighbouring parts, and anaftomofes with the collaterals of the cubitus. The other, which is larger, paffes behind the epitrochlea, fends out feveral rami to the neighbouring mufcles, and anaftomofes with the inter-mufcular of the arm: *the recurrent of the epitrochlea.*

The cubital then penetrates under the mufcles attached to the epitrochlea, and furnifhes two branches. *One* of thefe branches paffes between the inter-offeous ligament and the mufcles by which it is covered: the *anterior inter-offeous:* it furnifhes a ramus which glides between the two layers of the mufcles, and fome others which are diftributed to the mufcles and to the periofteum. Inferiorly, this artery traverfes the inter-offeous ligament, and terminates on the convexity of the hand, where it anaftomofes with the dorfal of the carpus.

The other, the *pofterior inter-offeous*, traverfes at the top the inter-offeous ligament, and gives out a branch, the *olecranian recurrent*, which is reflected between the olecranon and the epicondyle, in the fubftance of the epicondylo-cubitian mufcle. It diftributes itfelf to the neighbouring mufcles, and anaftomofes

anaſtomoſes with the exterior collateral artery. The poſterior inter-oſſeous then continues between the two layers of the muſcles of the ſuper-palmary face of the fore-arm, to which it ſends out a great number of rami, and terminates near the wriſt, anaſtomoſing with the anterior inter-oſſeous.

After furniſhing theſe rami, the cubital artery penetrates, at the top, under the common epitrochlo-phalanginian muſcle, and iſſues towards the middle of the fore-arm, from which it then proceeds as far as the wriſt: the *cubito-ſuper-palmaris.* At this place it gives out ſeveral rami, one of which diſtributes itſelf over the hand, anaſtomoſing with the dorſal of the carpus. Another tranſverſe branch paſſes before the articulation, and anaſtomoſes with a ſimilar one furniſhed by the radial artery. A third branch paſſes under the tendons of the common epitrochlo-phalanginian muſcle, and of the common cubito-phalangettian, and concurs to the formation of the profound palmary arch.

In the laſt place, the cubital artery deſcends into the palm of the hand, the *cubito-palmaris,* under the palmary aponeuroſis, and forms a tranſverſe arch from which ariſe four principal rami, ſometimes five, and even ſix. The firſt paſſes over the muſcles of the palmary face of the little finger, and terminates along its cubital edge; the ſecond proceeds in the interval between the fourth

and

and fifth bones of the metacarpus, and ſeparates into two rami, which terminate along the oppoſite edges of theſe two fingers; the third and fourth proceed, in like manner, to the ſummit of the other two intervals between the following fingers, and loſe themſelves along their oppoſite edges.

When the cubital furniſhes one or two rami more, they terminate alſo on the ſides of the index finger and the thumb. The ſuperficial palmary arch is then formed entirely by the cubital, but for the moſt part the latter rami proceed from the radial.

The two rami, which proceed on the ſides of each finger, anaſtomoſe with each other towards the nail-like extremity.

370. THE AORTA, after furniſhing, towards its curvature, the cephalic and brachial arteries, is reflected directly downwards, and deſcends, a little to the left, before the bodies of the dorſal vertebræ, between the laminæ of the poſterior mediaſtinum on the right ſide, and a little behind the œſophagus. It advances as far as the lower part of the breaſt, traverſes the diaphragm between its two pillars, and penetrates into the abdomen, where it advances as far as the fourth lumbar vertebra.

The

The *thoracic aorta*, during its paſſage, furniſhes ſeveral ſmall branches.

1ſt. It gives out one at the top, which expands on the poſterior part of the pericardium : *poſterior pericardian.*

2d. It furniſhes, at the top and on each ſide, a branch which follows the diſtribution of the bronchiæ in the interior of the lungs : *the bronchial.* The right branch, which in general is the largeſt, ariſes often from the trunk of the firſt inter-coſtal : it turns round on the œſophagus, gives out to it ſome rami, and proceeds to the origin of the bronchiæ, where it ſeparates into ſeveral rami, which are diſtributed on the aërian canals, and penetrate with them into the interior of the lungs. The left, which is often double, gives out rami to the œſophagus and the pericardium, and like the right diſtributes itſelf in the lungs.

3d. Before the aorta are obſerved three or four ſmall branches, diſtributed along the œſophagus, and which ſend out ſome rami to the poſterior mediaſtinum : the *œſophagian.*

4th. The aorta ſends out two or three rami, which expand on the poſterior mediaſtinum : the *poſterior mediaſtine.*

5th. Behind, and on the ſides of the aorta, there ariſe from nine to twelve branches, which proceed on the lateral parts of the bodies of the vertebræ, and are continued between the ribs : the *inter-coſtal.*

Theſe

Thefe branches, when they arrive between the heads of the ribs, feparate into two rami: fome proceed backwards, and are diftributed in the rachidian canal, and to the mufcles of the back; the reft continue along the inferior edge of the ribs, and proceed to the inter-coftian mufcles and thofe of the thorax, exhibiting frequent anaftomofes.

371. THE AORTA penetrates into the abdomen, through the aperture left between the two pillars of the diaphragm, and proceeds as far as towards the fourth vertebra of the loins, where it bifurcates.

The *abdominal aorta*, in its paffage, furnifhes branches which are diftributed to the diaphragm, the ftomach, the liver, and the fpleen, the inteftines, the fuper-renal capfules, to the kidneys, and the loins.

1ft. At the top, the abdominal aorta furnifhes, on the right and left, a branch which expands under the diaphragm: the *fub-diaphragmatic* (inferior diaphragmatic).

Each of thefe afcends before that mufcle, gives out fome rami to its pillars, to the liver (on the right fide), and to the fuper-renal capfule. It then divides into two rami, one of which proceeds towards the middle of the diaphragm, and the other on the fides of that partition: they both exhibit frequent anaftomofes.

2d. Before, it fends out a large trunk, which correfponds to the back part of the ftomach: the

OPISTO-

OPISTO-GASTRIC, and which divides into three branches. One of theſe proceeds to the ſtomach (the gaſtric), another to the liver (the hepatic), and the third to the ſpleen (the ſplenic).

The *gaſtric artery* proceeds towards the œſophagian orifice of the ſtomach, gives out different rami which ſurround that orifice, and others which aſcend along the œſophagus: it then ſeparates into ſeveral branches, which follow the ſmall curvature of the ſtomach, and expand on the two ſides of that organ, anaſtomoſing with each other, and with the gaſtro-epiploic artery, right and left.

For the moſt part, it furniſhes a branch which paſſes before the trunk of the vena portæ, penetrates into the left extremity of the tranſverſe ſulcus of the liver, and is diſtributed in its left lobe: *left lobar* (left gaſtro-hepatic).

The *hepatic artery* is larger than the preceding. Before it proceeds into the liver, it gives out different rami, one of which proceeds to the pylorus, and the ſmall curvature of the ſtomach, *the gaſtro-pyloric*; others are diſtributed to the pancreas, *the pancreatic*, and to the commencement of the duodenum, *duodenal*. A large ramus paſſes under the pylorus, proceeds in the ſubſtance of the great epiploon, advances towards the great curvature of the ſtomach, the *right gaſtro-epiploic*, and expands on the ſides of that viſcus, exhibiting frequent anaſtomoſes.

The hepatic, after furniſhing theſe arteries, proceeds

ceeds to the right lobe of the liver, *right lobar*; and ſends out a ramus, which divides itſelf on the ſides of the gall-bladder, *the cyſtic*; continues towards the right extremity of the tranſverſe ſulcus, and loſes itſelf in the ſubſtance of the liver.

The hepatic artery furniſhes ſometimes the left lobar.

The *ſplenic artery* is larger in adults than the hepatic; the contrary is the caſe in children: it proceeds to the left, in a furrow of the pancreas, and gives out ſeveral rami to that viſcus, *the ſpleno-pancreatic*; it then ſends out ſeveral rami which expand on the large cul-de-ſac of the ſtomach: *the ſpleno-gaſtric*. Before it proceeds to the ſpleen, this artery gives out alſo a branch which advances to the left, below the ſtomach, enters the laminæ of the large epiploon, *the left gaſtro-epiploic*, and furniſhes rami, ſome of which proceed to the left extremity of the pancreas, and others to the epiploon: *left epiploic*. This branch then expands on the large curvature of the ſtomach, where it terminates, anaſtomoſing with the right gaſtro-epiploic.

The ſplenic artery then proceeds to the ſpleen, and ſeparates into five or ſix branches, which penetrate through the ſciſſure, and diſtribute themſelves in its ſubſtance.

3d. Before the abdominal aorta, and below the opiſto-gaſtric, ariſes a large artery which diſtributes itſelf to the meſentery and the inteſtines: *the ſupe-*

rior

rior mesenteric. This artery descends obliquely, on the left, behind the pancreas, passes under the transverse meso-colon, returns to the right, and thus forms a curve between the laminæ of the mesentery.

In this passage, it gives out, superiorly, some rami to the pancreas, *the pancreatic*; and others to the commencement of the duodenum, *the duodenal.* It then furnishes a large trunk, which expands in the duplicature of the meso-colon, *the meso-colic*, and divides into two branches, one of which proceeds along the ascending part of the colon, and the other along its transverse part. Both these branches anastomose with their collaterals, and with each other.

This mesenteric artery then furnishes another branch, which proceeds transversely under the liver, towards the right portion of the colon: *the right colic.* It proceeds in the duplicature of the meso-colon, and divides itself into several rami, which expand on the ascending portion of that intestine, anastomosing with the collaterals.

Lower down, and towards its termination, the superior mesenteric furnishes a branch which descends on the right, and proceeds to the cœcum, the ileum and the colon: *the ileo-colic.* This branch advances behind the right lamina of the mesentery, and furnishes two rami, one of which anastomoses with the right colic, and the other proceeds along a portion of the ileum. This

branch

branch then continues towards the cœcum, and furniſhes a ramus to its appendix: *the cœcal.*

From the convexity of the ſuperior meſenteric artery ariſe, on the left, a great number of rami (from twelve to fifteen). Each of theſe ſeparates into two, which proceed in the folds of the meſentery, as far as the jejunum and the ileum. All theſe rami anaſtomoſe with the neighbouring ones, and form arches, whence ariſe other rami which unite with their collaterals to form ſmaller arches: this arrangement is repeated four and even five times. When theſe arches reach the inteſtines, they give birth to two right layers of ramuſculi, which expand in the ſubſtance of the ſides of the inteſtines, where they form a vaſcular reticulation, which covers the whole ſurface of them.

All the veſſels diſtributed on the inteſtines exhibit, in general, a ſimilar arrangement.

4th. The abdominal aorta gives out inferiorly, cloſe to its bifurcation, an artery which is diſtributed to the meſo-colon and to the meſo-rectum: *inferior meſenteric.* This artery, near its origin, ſends out a trunk which ſoon divides into two branches: the *firſt* proceeds towards the tranſverſe portion of the colon, and furniſhes two rami, one of which aſcends before the kidney, and proceeds towards the tranſverſe portion of the colon, where it terminates by uniting with a branch of the ſuperior meſenteric, and forms there a remarkable

 anaſtomoſis:

anaſtomoſis: *that of Riolan.* The other follows the direction of the deſcending portion of the colon, and terminates by anaſtomoſing inferiorly with the neighbouring rami: *left great colic* (ſuperior and middle colic).

The *ſecond*, which is not ſo large, proceeds towards the deſcending portion of the colon, and divides itſelf into two rami which anaſtomoſe with their collaterals: *the ſmall left colic.* A third is diſtributed to the commencement of the ſigmoid flexure of the colon, and anaſtomoſes with its neighbours.

In the laſt place, the inferior meſenteric artery, after giving out ſome rami to the iliac part of the colon, deſcends on the right, penetrates into the leſſer pelvis, diſtributes itſelf behind the rectum, and anaſtomoſes with ſeveral of the neighbouring rami: *artery of the rectum.*

5th. The abdominal aorta, immediately after furniſhing the ſuperior meſenteric, gives out, on each ſide, a branch which divides into ſeveral rami. Some of theſe proceed to the pillars of the diaphragm, and others to the ſuper-renal capſules, and the neighbouring adipoſe tiſſue: *the ſuper-renal* (middle capſular).

6th. Below the latter ariſe one, two, and ſometimes three, on each ſide of the aorta, which proceed tranſverſally towards the kidneys, *the renal,* furniſhing ſome ramuſculi to the ſuper-renal capſules, the neighbouring adipoſe tiſſue, and the

ureter.

ureter. When theſe branches reach the kidneys, they divide into ſeveral rami, which loſe themſelves in the ſinuoſities of that viſcus.

7th. Below the renal rami there ariſe, in general, on each ſide of the aorta, two long ſlender arteries, which proceed downwards in an oblique direction, along the pſoas, giving out ſome ſmall rami to the neighbouring parts. Each then iſſues from the abdomen, through the inguinal ring, deſcends along the teſticular cord, and proceeds to the epididymis and the teſticles: *the teſticular* (ſpermatic).

In the female, this artery penetrates into the leſſer pelvis, and diſtributes itſelf to the ovarium, giving out ſome rami to the broad ligaments, the conduits of the ovaria, and the lateral parts of the matrix: *artery of the ovarium.*

8th. The lateral and poſterior parts of the abdominal aorta give birth, on each ſide, to four or five arteries, which proceed tranſverſely on the bodies of the firſt four of the lumbar vertebræ. Theſe arteries furniſh ſome ramuſculi to the neighbouring parts, and then divide into two rami. Some of theſe proceed backwards between the tranſverſe apophyſes, give out rami which penetrate into their rachidian canal, and loſe themſelves in the muſcles of the back. The reſt paſs behind the prælumbo-trochantinian muſcles, ſend out rami to the pillars of the diaphragm, and to the ilio-tranſverſian; are reflected on the muſcles of the

the abdomen, and terminate by anaſtomoſing with rami of the laſt inter-coſtals, of the ſub-ſternal and ſub-pubian: *the lumbar.*

9th. Behind the abdominal aorta, and near its bifurcation, is an *odd* artery, which deſcends on the middle of the body of the laſt lumbar vertebra, before the middle part of the ſacrum, and as far as the coccyx: *middle ſacral.* In this paſſage it furniſhes on each ſide a ramus, which proceeds in a croſs direction on the body of the laſt vertebra, and anaſtomoſes with the neighbouring parts. It then continues and gives out ſeveral rami on the ſides of the ſacrum.

372. The abdominal aorta, when it reaches towards the fourth lumbar vertebra, divides into two branches: PELVI-CRURALES (iliac). Theſe two branches proceed downwards, and on the ſides, near to the articulation of the ſacrum with the bones of the ilium, where they again bifurcate, and furniſh two other branches: one of theſe penetrates into the pelvis, THE PELVIAN; and the other proceeds to the abdominal limb: THE CRURAL.

In the fœtus, the pelvi-crural ſeparates alſo into two branches, one of which proceeds to the abdominal limb, and the other, which is much larger, penetrates into the pelvis. The latter gives birth to two branches furniſhed in general by the pelvian, but in that caſe they are only very delicate rami: the body of the artery runs along the

ſides

ſides of the bladder, and then proceeds to the umbilicus.

373. The PELVIAN ARTERY penetrates into the leſſer pelvis, and gives birth to eight principal branches, or arterial bundles, which extend over its ſides, and are diſtributed to the different organs it contains.

1ſt. At the top and behind, a branch which aſcends on the ſide, and divides itſelf into two rami; the firſt proceeds on the lateral parts of the bodies of the laſt lumbar vertebræ, and is diſtributed on the prælumbo- and iliaco-trochantinian muſcles, and enters into the rachidian canal. The ſecond aſcends outwardly, and diſtributes itſelf in the iliac foſſa: *iliaco-muſcular.*

2d. Several branches which proceed on the ſides of the ſacrum, furniſh rami to that bone, and others which proceed, through the ſacral holes, into the vertebral canal: *lateral ſacral.*

3d. An artery which proceeds before, and on the ſides of the pelvis, as far as the interior ſub-pubio-trochantinian muſcle: *the ſub-pubio-femoral.* In this paſſage it ſends ſome rami to the prælumbo- and ilio-trochantinian muſcles, paſſes through the ſub-pubian hole, traverſing the interior ſub-pubio-trochantinian, and gives two rami, one on the right and the other on the left, which diſtribute themſelves upwards and inwards to the muſcles of the thigh.

4th. Before, an artery very large in the fœtus,

 and

and in a great part obliterated in adults. In the latter, it furnishes some rami, which are distributed on the sides of the bladder, to the matrix, the vagina, &c.: *the umbilical.*

5th. Above the latter, some branches which proceed to the bladder, the rectum and the uterus. One of these branches passes between the bladder and the rectum, and distributes itself to these organs, to the prostate gland and the seminal vessels. In the female, this artery gives out a considerable branch which penetrates the broad ligament, runs along the sides of the matrix, and the Fallopian tube, proceeds to the ovarium, and anastomoses with the artery of that part. Another ramus is distributed to the vagina: *the vesico-prostatic* (uterine and vaginal vesicals).

6th. The pelvian artery, near its termination, gives out a large branch, which distributes itself to the muscles of the nates, *fessière* (posterior iliac). This branch furnishes, in the lesser pelvis, some rami to the rectum, and to the sacro-trochanterian muscle: it then issues from this cavity, passing by the summit of the ischiatic notch, and soon separates into several branches, which expand between the great and the lesser trochanterian and the sacro-femorian muscles.

7th. Below the preceding arises another artery, which gives some rami to the rectum, the bladder, and the uterus. It then issues from the pelvis above the sacro-trochanterian muscle, towards the

lower

lower part of the iſchiatic notch, and divides itſelf into ſeveral rami, which expand under the ſacro-femorian muſcle, towards the coccyx, the tuberoſity of the iſchium, and to the poſterior muſcles of the thigh: *the iſchiatic.*

8th. In the laſt place, the pelvian artery gives a branch, which ariſes generally from a trunk common to the preceding. It iſſues from the pelvis, between the pubio-ſub-umbilian and the iſchio-coccygian muſcles, advances on the interior face of the iſchiatic tuberoſity, and terminates at the organs of generation: *the ſub-pelvian* (interior pudical).

In the pelvis, it furniſhes rami to the bladder, and often a large ramus to the middle part of the rectum. On the outſide of this cavity, it gives rami to the ſacro-trochanterian and the ſacro-femorian muſcles; it then furniſhes two branches: one of theſe, which is ſuperficial, paſſes over the tuberoſity of the iſchium, and proceeds to the ſcrotum: *the perinæal:* the other penetrates to a greater depth between the tuberoſity of the iſchium and the canal of the urethra, and gives rami to the muſcles of the anus and of the perinæum: *iſchio-perinæal* (tranſverſe of the perinæum). When it reaches the lower part of the ſymphyſis of the pubis, this branch divides itſelf into two other rami, one of which paſſes under the root of the cavernous body, proceeds over the back of the penis, and termi-

nates in the ſubſtance of the glans: the other loſes itſelf in the cavernous body.

In the female, the perinæal artery loſes itſelf in the large labia; and the profound one proceeds to the clitoris: *the iſchio-clitorian.*

374. THE CRURAL ARTERY ariſes before the junction of the ſacrum with the hip-bone; it proceeds towards the ilium, paſſes under the crural arch, deſcends firſt on the interior ſide of the femur, and then behind that bone, and terminates at the ham, where it ſeparates into two branches, which are diſtributed to the leg and to the foot.

The crural artery, in order to facilitate the deſcription of it, is divided into three portions: one correſponds to the pelvis, near the iliac foſſæ (the iliac); another correſponds to the groin (the inguinal); and the third extends along the thigh (the femoral).

THE ILIAC PORTION furniſhes interiorly a branch which proceeds on the pubis, *ſub-pubian* (epigaſtric), and is reflected under the ſides of the abdomen, chiefly along the ſterno-pubian, forming ſeveral anaſtomoſes. It gives out a ramus, which accompanies the teſticular cord as far as the teſticles, and terminates below the ſternum, anaſtomoſing with the ſub-ſternal.

The other artery, furniſhed by the iliac portion, aſcends interiorly as far as the anterior angle of the ilium, turns round on the edge of that bone, and

and expands in ſeveral rami in the muſcles of the abdomen, and in the ilio-trochantinian, producing ſome anaſtomoſes: *circumflex of the ilium* (anterior iliac).

The INGUINAL PORTION furniſhes exteriorly ſome branches, which are ramified in the inguinal glands, the muſcles and neighbouring integuments: *the inguinal* (tegumentous of the abdomen.)

Interiorly, this portion gives out two or three ſmall branches, which are diſtributed to the region of the pubis, to the ſcrotum *(the ſcrotal)*, or to the vulva, the *vulvar* (exterior pudical).

The FEMORAL PORTION gives to the upper part of the thigh a large branch, which penetrates between the triceps adductor and the tri-femoro-rotulian muſcle, and is diſtributed behind the thigh: *the inter-muſcular or profound of the thigh*. This artery furniſhes, near its origin, two large rami, one of which proceeds inwards between the ſub-pubio-femorian and the tendon of the præ-lumbo-trochantinian muſcle, and terminates in ſeveral ramuſculi, which are diſtributed to the muſcles of the ſuperior and interior part of the thigh, around the articulation, and to the exterior parts of generation: *the ſub-trochantinian* (the interior circumflex).

The other deſcends exteriorly, paſſes between the ilio-prætibian and the ilio-rotulian muſcles, and

and divides itſelf into two rami, the firſt of which is reflected around the articulation, and loſes itſelf in the muſcles of the poſterior part of the thigh: the ſecond deſcends before the thigh, and expands between the ilio- and the trifemoro-rotulian: *the ſub-trochanterian* (exterior circumflex).

The profound artery then deſcends, and gives out a great number of rami, which are diſtributed interiorly and poſteriorly to the muſcles of the thigh: it furniſhes alſo a ramuſculus, which penetrates into the thigh.

The femoral artery, after ſending out the profound one, deſcends below the ilio-prætibian muſcle, furniſhing in its paſſage a great number of rami to the neighbouring muſcles: the *muſcular*. Towards the lower third of the thigh, it traverſes the tendon of the third adductor, proceeds to the poſterior part of the thigh, and deſcends along the ham behind the articulation, where it aſſumes the name of the POPLITEAN. In this ſhort paſſage it furniſhes four branches, two on each ſide, the one above the other: *the poplitean articular* (the ſuperior and inferior articular).

Of the two ſuperior, one (the interior) aſcends within, paſſes above the interior condyle of the femur, and diſtributes itſelf to the articulation of the knee. In this paſſage, it gives rami to the neighbouring muſcles, to the interior lateral ligament, the articular capſule, and upon the rotula. The other

other (the exterior), which is more profound, afcends on the exterior condyle of the femur, and diftributes itfelf to the articulation, fending out rami, which terminate, like the preceding, at the fimilar parts of the oppofite fide.

Below thefe branches, the poplitean artery produces feveral more rami, which proceed to the periofteum of the femur, and behind the articular capfule.

Of the two inferior branches furnifhed by the poplitean, the *exterior* arifes below the poplito-tibian mufcle, defcends on the outfide, and paffes under the exterior lateral ligament of the articulation between the femur and the tibia. It furnifhes rami to the poplito-tibian, to the tendons of the neighbouring mufcles, and to the articulation, and divides into two rami, one of which paffes behind and the other before the rotula.

The *interior* arifes a little lower down; it is covered by the bifemoro-calcanian mufcle, defcends under the condyle of the tibia, and terminates on the interior fide of the articulation and on the rotula, like the preceding. The four rami which terminate on the rotula form between them an anaftomotic circle.

The poplitean artery, when it reaches below the condyles of the tibia, divides itfelf into two branches. One, which is profound, traverfes fuperiorly the inter-offeous ligament, and defcends before

before the leg as far as the foot: *anterior tibial.* The other defcends along the pofterior part of the leg, as far as the fole of the foot: *pofterior tibial.*

375. THE ANTERIOR TIBIAL paffes between the tibia and the perone; traverfes at the top the inter-offeous ligament; defcends before the leg, between the tibio-fuper-tarfian and the common peronæo-fuper phalangettian mufcle of the toes, and expands on the foot.

After having pierced the inter-offeous ligament, this artery gives out a ramus which is reflected before the articulation, *recurrent of the knee*, and then furnifhes a great number to the anterior mufcles of the leg. When it arrives towards the lower third of the tibia, it iffues from below the mufcles, paffes before that bone, and defcends below the annular ligament, where it gives out a ramus, on each fide of the articulation of the foot: *the malleolar.*

When it reaches the tarfus, *fuper-tarfian*, it divides itfelf into two branches, *one* of which proceeds outwards on the common calcaneo-fuper-phalangettian mufcle, and forms a curvature. The concavity of this curvature furnifhes fome rami to the articulation of the bones of the tarfus. From its convexity three rami proceed, which advance towards the bones of the metatarfus: when they approach the heads of thefe bones, they divide themfelves into two ramufculi which expand on the

the ſides of the toes. The *other*, which is larger, proceeds on the tarſus, as far as the os cuboides, where it gives out a branch which paſſes over the firſt inter-oſſeous muſcle, and advances towards the anterior extremity of the firſt bone of the metatarſus, where it divides itſelf into two ramuſculi, which loſe themſelves on the ſides of the firſt and ſecond toes.

The trunk of the anterior tibial penetrates between the heads of the firſt and ſecond bone of the metatarſus, *ſuper-metatarſian*, and divides itſelf into two branches: *one* of theſe branches anaſtomoſes with the exterior plantaris, and concurs towards the formation of the plantar arch: the *other* diſtributes itſelf under the great toe.

376. THE POSTERIOR TIBIAL, at its origin, ſends out a very large branch, which deſcends behind the perone: *the peronæal.* This artery is covered by the tibio-calcanian, and the peronæo-ſub-phalangettian muſcle of the great toe: it ſends out a great number of rami, which are diſtributed to the muſcles of the poſterior and exterior part of the leg. The peronæal then deſcends between the extremities of the tibia and of the perone, and divides itſelf into two branches, one of which paſſes under the calcanian tendon, diſtributes itſelf around the articulation, and terminates on the exterior ſide of the foot by ſeveral anaſtomoſes. The other

other pierces the inter-osseous ligament, descends before the articulation of the tibia and the perone, and terminates in several rami, which proceed over the foot, anastomosing with the super-tarsian and the exterior malleolar.

The posterior tibial then descends behind the tibia, under the tibio-calcanian muscle, as far as the lower part of the leg, where it becomes superficial.

In its passage, it sends out a great number of rami to the muscles of the posterior part of the leg, and a ramus which penetrates into the tibia: *the medullary of the tibia.* When it reaches the interior side of the calcaneum, it divides itself into two branches: one of these branches follows the interior edge of the foot, the *interior plantaris*; sends out rami to the muscles of the great toe, and terminates on its interior side, anastomosing with super-metatarsian rami. The other, the *exterior plantaris*, which is larger, penetrates between the muscles of the sole of the foot, to which it distributes itself. When it approaches the fifth bone of the metatarsus, it is reflected inwards, and forms a curvature, the convexity of which is turned forwards. This curvature sends out some rami, which proceed backwards, and distribute themselves in the muscles, on the bones of the metatarsus. It furnishes three rami which ascend through the metatarso-

inter-

inter-phalangian mufcles. It then fends out four larger rami, in the interval of the bones of the metatarfus; thefe rami, when they arrive between the heads of thefe bones, divide into two ramufculi, which expand on the fides of the toes.

All the rami which proceed on the fides of the toes anaftomofe at their extremities.

TABLE

TABLE OF THE HEART AND ARTERIES.

377. THE blood, which returns from every part of the body, is conveyed to the heart by two large veins, the *venæ cavæ:* these veins pour it into a sinus, *sinus of the venæ cavæ*, (right or pulmonary auricle,) through two orifices, one at the top, the other at the bottom: the latter is furnished with a valve, or portion of valve, in the form of a crescent.

From this sinus the blood passes into the right or pulmonary ventricle, through a circular aperture furnished with a tricuspid valve. It issues from this ventricle by an orifice provided with a triple semilunar valve (sigmoid), and proceeds into the pulmonary artery.

The pulmonary artery, which contains venous blood, divides itself, after a short passage, into two trunks which proceed to the two lungs. The right trunk divides into three branches, and the left into two, each of which is divided and subdivided indefinitely, and terminates in exceedingly fine ramusculi, which proceed on the sides of the last bronchial cells, into which the air penetrates during respiration. These arteriolæ, it is probable, anastomose with the veins which bring the blood from every part of the lungs.

The small veins unite to form venous rami, which produce branches, and the union of branches forms two large trunks for each lung.

The four pulmonary veins contain arterial blood; they proceed into a sinus, *sinus of the pulmonary veins* (left or aortic auricle), which is smaller than the preceding, and the sides of which are thicker.

From this sinus the blood passes into the left or aortic ventricle, through a round aperture furnished with a two-pointed valve (valvula mitralis). This valve is smaller and thicker than the preceding; it drives the blood into the aorta, whence it is distributed to all the parts, by means of numerous arteries which are divided and subdivided indefinitely.

The aorta, on issuing from the heart, proceeds in an oblique direction to the right; returns to the left, and forms a curvature, which terminates at the height of the third dorsal vertebra; it then descends

decends to the left, along the bodies of the dorsal vertebræ, passes between the pillars of the diaphragm, penetrates into the abdomen, and terminates at the height of the fourth lumbar vertebra, where it divides into two branches.

THE AORTA GIVES,

At its origin,

Two arteries, which are reflected on the heart,

NEW NAMES.	OLD NAMES.
The cardiac.	*Coronary.*

From each side of its curvature,

Two large trunks*, one of which is distributed to the head,

The cephalic.	*Primitive carotid.*

and the other to the thoracic limb,

The brachial.	*Sub-clavian.*

Along the thorax,

Several branches, which proceed

To the pericardium,

The posterior pericardian.	*The same.*

To the bronchiæ,

The bronchial.	*The same.*

To the æsophagus,

The œsophagian.	*The same.*

To the mediastinum,

Posterior mediastine.	*The same.*

Between the ribs,

The intercostal.	*Inferior or aortic intercostal.*

In the abdomen branches which are distributed

To the abdominal face of the diaphragm,

The sub-diaphragmatic.	*Inferior diaphragmatic.*

To the stomach, the liver, and the spleen,

The opisto-gastric.	*Cœliac trunk.*

To the mesentery and the intestines,

Sup. and infer. mesenteric.	*The same.*

To the super-renal capsule,

The super-renal.	*Middle capsular.*

* They proceed immediately from the left side; but on the right, the aorta, in general, furnishes only one trunk, which is divided.

To the kidneys,

NEW NAMES.	OLD NAMES.
The renal.	*The same.*

To the testicle or the ovarium,

The testicular.	*The spermatic.*
Artery of the ovarium.	

To the lumbar region,

The lumbar.	*The same.*

To the sacrum,

Middle sacral.	*The same.*

The aorta, *at its termination*, divides into two branches, which are distributed to the pelvis and to the abdominal limb,

The pelvi-crural.	*Primitive or common iliac.*

THE AORTA AT ITS ORIGIN FURNISHES,

I. The CARDIAC arteries, one of which is inferior or right, and the other superior or left.

II. The CEPHALIC TRUNK, which divides into two branches at the height of the larynx; one of these branches is distributed to the exterior part of the head,

The maxillo-facial.	*Exterior carotid.*

The other penetrates into the interior of the cranium,

The anterior cerebral.	*Interior carotid.*

A. The MAXILLO-FACIAL gives eight principal branches:

1st. One is distributed to the thyroid gland, to the larynx, and to the os hyoides,

Superior thyroidian.	*The same.*

It furnishes the laryngian and several rami.

2d. One proceeds to the tongue and to its different muscles,

The lingual.	*The same.*

It gives the sub-lingual and a hyoidian ramus.

3d. One furnished to the pharynx and the velum palati,

Inferior pharyngian.	*The same.*

It sends out the posterior meningian.

4th. One is distributed to the maxillary gland, to the jaws, to the commissuræ of the lips, and as far as the tip of the nose,

The labial.	*Exterior maxillary.*

It

It gives out, the musculo-palatine, the sub-maxillary, the tonsillary, the inferior labial, the two coronary labial, and some rami.

5th. A branch which proceeds to the occiput,

NEW NAMES.	OLD NAMES.
The occipital.	*The same.*

It furnishes muscular and cutaneous rami.

6th. One expands behind the ear, within that organ and on the occiput,

Posterior auricular.	*The same.*

It gives out the stylo-mastoidian, the tympanic, some muscular and cutaneous rami.

7th. One distributes itself on the sides of the head to the parotid gland, before the ear, to the cheek, and to the integuments of the upper part of the head,

The temporal.	*The same.*

It gives the anterior auricular, the sub-zygomatic (transverse of the face), *and the superficial temporals.*

8th. One proceeds to the meninx, to the teeth, to the muscles of the jaw, to the cheek, to the pharynx, to the velum palati, and to the nasal fossæ,

The maxillo-buccal.	*Interior maxillary.*

It gives the middle meningian, the maxillo-dentary (inferior dentary), *the pterygoidian, the profound temporals, the zygomato-maxillary* (masseterine), *the super-maxillary* (buccal), *the sub-orbitar, the superior pharyngian, the palatine, and the spheno-palatine.*

B. The ANTERIOR CEREBRAL penetrates into the cranium, and at its entrance gives a branch which proceeds in the orbit, distributing itself to the lacrymal gland, to the eye and to its muscles, to the eye-lids and in the nose,

The orbitary.	*Ophthalmic.*

Which gives the lacrymal, the sub-irian (ciliary), *the ethmoidals, the central of the retina, the muscular, the palpebral, the frontal, and the nasal.*

The anterior cerebral is afterwards distributed in the anterior and middle lobes of the brain:

It furnishes,

The communicating.	*The same.*

Which gives some rami to the choroid plexus, choroidian,

NEW NAMES.	OLD NAMES.
The anterior lobar.	*Artery of the corpus callosum.*
The middle lobar.	

III. The BRACHIAL TRUNK, which in its passage along the thoracic limb is divided into sub-claviar, axillary, and humeral.

A. The SUB-CLAVIAR furnishes six branches:

1st. One is distributed to the posterior part of the brain, to the cerebellum, and to the rachidian prolongation,

The posterior cerebral.	*The vertebral.*

It furnishes,

The occipito-meningian.	*Posterior meningian.*
The anterior and posterior median of the rachis	*Anterior and posterior spinal.*
The inferior large cerebellous.	*Inferior of the cerebellum.*
The mesencephalic.	*The basiliary.*
The posterior lobar.	*The posterior or inferior of the cerebrum.*
The inferior small cerebellous.	*Inferior of the cerebellum.*
The superior cerebellous.	*Superior of the cerebellum.*

2d. One is distributed below the sternum, to the thymus, to the mediastinum, to the diaphragm, and to the parietes of the abdomen,

The sub-sternal.	*Interior mammillary.*

It gives mediastine, sub-mammillary, inter-costal, super-diaphragmatic (superior diaphragmatic) *rami,*

Which furnish a thymic and bronchial ramus.

3d. One proceeds to the thyroid gland and to the muscles of the neck,

Inferior thyroidian.	*The same.*

It furnishes the ascending cervical and several rami.

4th. One proceeds on the sides of the neck,

The trachelo-cervical.	*Posterior profound cervical.*

5th. One is distributed to the muscles of the lateral parts of the neck and of the shoulder,

Trachelo-scapular.	*Transverse cervical.*

It furnishes,

The superior scapulary.

6th. One proceeds beneath the first rib, and gives some rami to the œsophagus,

Superior inter-costal.	*The same.*

B. The

B. The AXILLARY furnishes five principal branches:

1st. One branch is distributed to the pectoral muscles,

NEW NAMES.	OLD NAMES.
The sterno-thoracic.	*The superior thoracic.*

2d. Another to the costo-scapulian and the inter-costian muscles, and to the breast,

The costo-thoracic.	*The inferior thoracic.*

3d. One proceeds on the summit of the shoulder,

The super-scapulary.	*Acromial.*

4th. One proceeds to the muscles of the interior side of the scapula,

Sub-scapular.	*Common scapular.*

5th. One is distributed around the articulation of the shoulder with the arm,

The scapulo-humeral.	*Anterior and posterior circumflex.*

C. The HUMERAL ARTERY (brachial) furnishes three principal branches before it divides at the bend of the arm:

1st. One branch penetrates profoundly into the muscles of the arm,

The inter-muscular or profound.

It furnishes,

The interior and exterior collateral.

2d. Several rami are distributed to the muscles of the anterior part of the arm,

Muscular of the arm.

3d. Two rami proceed on the sides of the articulation of the elbow;

Collaterals of the articulation of the elbow.

The humeral artery, when it reaches the bend of the arm, divides into two branches,

The radial and the cubital.

A. The RADIAL furnishes four principal branches:

1st. One which is reflected towards the epicondyle,

Recurrent of the epicondyle.	*Radial recurrent.*

2d. Rami which proceed to the radial side of the fore-arm,

The muscular of the fore-arm.

 3d. A branch

3d. A branch which is distributed in the palm of the hand to the last fingers, and which concurs towards the formation of the superficial palmar arch,

NEW NAMES.	OLD NAMES.
The radio-palmar.	*The palmar radial.*

4th. A branch which descends on the back of the hand, sends out a ramus to its palmar surface, and concurs towards the formation of the profound palmar arch,

Radio-super-palmar.	*Dorsal Radial.*

B. The CUBITAL furnishes four principal branches:

1st. Two are reflected towards the epitrochlea where they are distributed,

Recurrent of the epitrochlea.	*Anterior and posterior cubital recurrent.*

2d. Two are directed on the faces of the inter-osseous ligament,

The inter-osseous.	*Anterior inter-osseous.* *Posterior inter-osseous.*

The posterior inter-osseous furnishes a branch which is reflected towards the olecranon,

Olecranian recurrent.	*Posterior radial recurrent.*

3d. One is distributed to the back of the hand,

Cubito super-palmar.	*Cubital dorsal.*

4th. One proceeds in the palm of the hand to the first three fingers, and forms in a great measure the superficial palmar arch,

The cubito-palmar.	*The palmar.*

THE AORTA GIVES IN THE THORAX:

1st. A branch, which is distributed to the posterior part of the pericardium,

Posterior pericardian.

2d. Two arteries, which proceed to the bronchiæ and are ramified with them in the lungs,

The bronchic.	*Bronchial.*

3d. Some rami, which are distributed to the œsophagus,

The œsophagean.	*The same.*

4th. Some small arteries, which expand on the posterior part of the mediastinum,

Posterior mediastine.	*The same.*

5th. From

5th. From nine to twelve branches, which divide between the heads of the ribs into two rami, one of which is distributed to the muscles of the back and the other to the inter-costal muscles,

NEW NAMES.	OLD NAMES.
The inter-costal.	*Inferior or aortic intercostals.*

THE AORTA FURNISHES IN THE ABDOMEN,

I. Two branches, which are distributed to the two sides of the abdominal surface of the diaphragm, and give some rami to the super-renal capsules and to the liver,

Sub-diaphragmatic. . . . . . *Inferior diaphragmatic.*

II. A large trunk situated beneath the stomach,

THE OPISTRO-GASTRIC. . . . . . *Cœliac.*

Which divides into three branches:

1st. One is distributed to the stomach,

The gastric. . . . . *Stomachic coronary.*

It furnishes sometimes

The left lobar of the liver. . . . *Left gastro-hepatic.*

2d. The other proceeds to the liver,

The hepatic.

It gives rami

To the pylorus,

The gastro-pyloric. . . . . *Pyloric.*

To the pancreas and the duodenum,

The pancreatico-duodenal.

To the stomach and the epiploon,

Right gastro-epiploic. . . . . . . *The same.*

To the gall bladder,

The cystic.

3d. The last proceeds to the spleen,

The splenic. . . . . . *The same.*

And gives branches

To the pancreas,

The spleno-pancreatic.

To the stomach,

The spleno-gastric. . . . . . . *Short vessels.*

To

To the left side of the great epiploon,

NEW NAMES.	OLD NAMES.
Left gastro-epiploic.	

III. A large branch, which is distributed to the mesentery of the small intestines, to these intestines and to the cœcum,

The superior mesenteric.	*The same.*

It gives rami

To the pancreas,

The pancreatic.

To the duodenum,

The duodenal.

To the meso-colon,

The meso-colic.

To the right colon,

The right colic.

To the cœcum, the ilium, and the colon,

The ilio-colic.

To the cœcum,

The cœcal.

IV. A branch, which arises near the bifurcation of the aorta, and is distributed to the mesentery and the large intestines,

The inferior mesenteric.	*The same.*

It furnishes,

The left great colic.	*Superior left colic.* *Middle left colic.*
The small left colic. . . . . . . Artery of the rectum.	*Inferior left colic.*

V. Two branches, which are distributed to the super-renal capsules and to the cellular tissue of the kidney,

The super-renal.	*Middle capsular.*

VI. Two large branches, which proceed to the kidneys,

The renal.	*The same.*

They furnish super-renal, adipose, and ureteric rami.

VII. Two small arteries, which proceed to the testicles or to the ovarium,

The testicular. . . . . . Artery of the ovarium.	*The spermatic.*

3 VIII. Four

VIII. Four or five arteries, which are distributed to the muscles of the loins and to the parietes of the abdomen,

NEW NAMES.	OLD NAMES.
The lumbar.	*The same.*

IX. An *odd* branch, which arises between the two divisions of the aorta and descends on the sacrum,

The middle sacral.

THE AORTA AT ITS TERMINATION DIVIDES INTO TWO TRUNKS:

THE PELVI-CRURAL.	*The primitive iliac.*

The pelvi-crural artery, which arises at the height of the fourth lumbar vetebra, descends outwardly, and after a short passage divides into two branches; one of which is distributed in the pelvis,

THE PELVIAN.	*Interior or hypogastric iliac.*

The other issues from the pelvis through the crural arch, and descends along the thigh,

THE CRURAL.	*The same.*

A. The PELVIAN divides into eight principal branches or arterial bundles:

1st. A branch is distributed in the muscules of the iliac fossa,

The iliaco-muscular.	*Ilio-lumbar.*

2d. Several proceed on the sides of the sacrum,

The lateral sacral.	*The same.*

3d. One issues from the pelvis through the sub-pubian hole, and is distributed to the three adductors,

The sub-pubio-femoral.	*Obturatrix.*

4th. Another, considerable in the fœtus and almost obliterated in adults, is distributed to the bladder, to the uterus, and to the vulvo-uterine conduit,

The umbilical.	*The same.*

5th. One proceeds to the bladder, to the prostate gland, to the rectum, to the uterus, and to the vaginal conduit,

The vesico-prostatic.	*Uterine and vaginal vesical.*

6th. Branches

6th. Branches which proceed to the muscles of the nates,

NEW NAMES.	OLD NAMES.
The fessieres.	*Posterior iliac.*

7th. A branch passes under the sacro-femorian muscle, accompanies the sciatic nerve, and loses itself in the muscles of the posterior part of the thigh,

The ischiatic.

8th. The last is distributed to the organs of generation,

The sub-pelvian.	*The interior pudical.*

The latter furnishes,

The perinæal.	*Transverse of the perinæum.*
The ischio-penian.	*Dorsal of the yard.*
The ischio-clitorian.	*Artery of the clitoris.*

B. The CRURAL divides into three portions: the iliac, inguinal, and femoral.

I. The ILIAC PORTION furnishes two branches, one of which is reflected on the sides of the abdomen, and loses itself in the muscles,

The super-pubian.	*Epigastric.*

The other follows the direction of the ridge of the ilium, and loses itself in the muscles of the abdomen,

Circumflex of the ilium.	*Anterior iliac.*

II. The INGUINAL PORTION furnishes branches, which are ramified to the glands of the groin and to the neighbouring cellular tissue,

The inguinal.	*Tegumentous of the abdomen.*

And some branches, which proceed to the scrotum or to the vulva,

The scrotal.	*Exterior pudical.*
The vulvar.	

III. The FEMORAL PORTION gives:

1st. A large branch, which is distributed profoundly in the muscles of the thigh,

Inter-muscular or profound.	*Profound artery.*

The

The latter furnishes from its upper part two branches, one of which proceeds inwards and turns round on the articulation of the femur,

NEW NAMES.	OLD NAMES.
Sub-trochantinian.	*Interior circumflex.*

The other loses itself on the exterior side of the articulation,

Sub-trochantinian.	*Exterior circumflex.*

2d. Branches along the thigh,

The muscular.

3d. Four branches, two on each side, and one above the other, which are distributed to the articulation of the knee,

Popliteal articular.	*Superior and inferior articular.*

The femoral, when it reaches the ham, divides itself into two branches:

The anterior and posterior tibial.

a. The ANTERIOR TIBIAL divides itself into four branches:

1st. One small one is reflected towards the knee,

Recurrent of the knee.

2d. Two proceed towards the sides of the articulation of the foot,

The malleolar. . . . .

3d. A branch is directed on the tarsus, and distributes itself to the muscles and bones of that part,

The super-tarsian.	*Artery of the tarsus.*

4th. The last forms a curvature on the convexity of the foot,

The super-metatarsian.	*Artery of the metatarsus.*

b. The POSTERIOR TIBIAL gives first two branches:

1st. One descends behind the perone, and is distributed to the muscles of the posterior part of the leg,

The peroneal.	*The peroneal.*

2d. The other, which is very small, penenetrates into the medullary canal of the tibia through its nourishing foramen,

Medullary of the tibia. . . .	*Nourishing of the tibia.*

 At

At the lower part of the leg the posterior tibial divides itself into two branches:

1st. One follows the interior edge of the foot and terminates on the great toe,

NEW NAMES.	OLD NAMES.
Interior plantar.	*The same.*

The other penetrates below the sole of the foot and forms the plantar arch, from which rami proceed to the muscles of the sole of the foot and to the toes,

Exterior plantar.	*The same.*

END OF THE FIRST VOLUME.

Wilks and Taylor, Printers, Chancery-Lane.

TABLE OF THE BONES WHICH FORM THE SKELETON.

THE SKELETON IS COMPOSED

- 1st. OF THE TRUNK, *which comprehends,*
  - 1st. THE VERTEBRAL COLUMN, *formed by*
    - 24 VERTEBRA, viz. 7 cervical (the 1st Atloid, the 2d Axoid), 12 dorsal, 5 lumbar, the sacrum and the coccyx.
  - 2d. THE THORAX, *formed by*
    - 12 RIBS on each side (7 sternal, 5 asternal), the sternum and the 12 dorsal vertebræ.
- 2d. OF THE HEAD, *which comprehends,*
  - 1st. THE CRANIUM, *formed by*
    - The sphenoid, the frontal, the parietals, the occipital, the temporals, and the ethmoid.
  - 2d. THE FACE, *formed by*
    - The frontal, the sphenoid, the bones of the nose, the lachrymals, the zygomas, the super-maxillary, the palatine bones, the ethmoid, and its turbinated bones, the maxillary; 32 teeth, 8 of which are incisors, 4 angular, and 20 molar.
- 3d. OF THE LIMBS
  - 1st. THE THORACIC, *formed by*
    - 1st. THE SHOULDER, *formed by*
      - 1st. The clavicle;
      - 2d. The scapula.
    - 2d. THE ARM, *composed of*
      - The humerus.
    - 3d. THE FORE-ARM, *composed of*
      - 1st. The cubitus.
      - 2d. The radius.
    - 4th. THE HAND, *formed by*
      - 1st. THE CARPUS, *composed of*
        - 8 bones in two rows, which are *counted* from the thumb, and which are called:
          - 1st Row. 1st. The scaphoid, 2d. the similunar, 3d. the cuneiform, 4th. the pisiform.
          - 2d Row. 1st. The trapezium, 2d. the trapezoid, 3d. os magnum, 4th. the unciform.
      - 2d. THE METACARPUS, *composed of*
        - 5 bones of the metacarpus.
      - 3d. THE FINGERS, *each composed of*
        - 3 phalanges (2 in the thumb), which are *counted* from the metacarpus; and which are called Phalanges, Phalangines, Phalangettes.
  - 2d. THE PELVIAN, *formed by*
    - 1st. THE HAUNCH, *composed of*
      - The hip-bone.
        - The two hip-bones, with the sacrum and coccyx, form the pelvis.
    - 2d. THE THIGH, *composed of*
      - The Femur.
    - 3d. THE LEG, *formed by*
      - 1st. The Tibia.
      - 2d. The Perone.
      - 3d. The Rotula.
    - 4th. THE FOOT, *formed by*
      - 1st. THE TARSUS, *composed of*
        - 7 bones: the astragulus, the calcaneum, the scaphoid, the 3 cuneiform bones, and the cuboid.
      - 2d. THE METATARSUS, *composed of*
        - 5 bones of the metatarsus.
      - 3d. THE TOES, *each composed of*
        - 3 phalanges (2 in the great toe), which are *counted* from the metacarpus, and which are *called* Phalanges, Phalangines, Phalangettes.

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